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MINERALS YEARBOOK

1963

Volume II of Four Volumes

MINERAL FUELS

Prepared by staff of the
BUREAU OF MINES

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UNITED STATES DEPARTMENT OF THE INTERIOR • Stewart L. Udall, Secretary

BUREAU OF MINES • Marling J. Ankeny, Director

Created in 1849, the Department of the Interior—a Department of Conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

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FOREWORD

The 1963 MINERALS YEARBOOK marks the 82d year in which this publication or its predecessors have been issued by the Federal Government. It also marks the first issue of a fourth volume reviewing world mineral production, consumption, and trade on a country-by-country basis. This new international review volume represents the Bureau's continuing effort to make the Yearbook as useful as possible to industry, Government, and the general public.

Many difficulties had to be surmounted in preparing this new volume. Although it has not been possible in several instances to present international data comparable to those available for the United States, the international review should nevertheless prove a valuable reference.

The general content of this four-volume edition is as follows:

Volume I contains chapters on metal and on nonmetal mineral commodities except mineral fuels. In addition, it includes a chapter reviewing these mineral industries, a statistical summary, and chapters on mining and metallurgical technology, employment and injuries, and technologic trends.

Volume II contains a chapter on such related products as helium, carbon black, peat, coke and coal chemicals, and natural gas liquids. Also included are data on employment and injuries in the fuel industries, and a mineral-fuels review summarizing recent economic and technological developments.

Volume III contains chapters covering each of the 50 States, United States island possessions in the Pacific Ocean, the Commonwealth of Puerto Rico, and island possessions in the Caribbean Sea, including the Canal Zone. Volume III also has a statistical summary chapter, identical with that in Volume I, and a chapter on employment and injuries.

Volume IV contains 124 chapters representing the latest available mineral statistics for more than 130 foreign countries and areas.

To my knowledge, the Minerals Yearbook is now the most comprehensive publication of its kind available. The Bureau will continue its efforts in the years to come to increase the Yearbook's value to its many users. Toward that end, the constructive comments and suggestions of readers will be helpful.

MARLING J. ANKENY, *Director.*

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ACKNOWLEDGMENTS

The chapters in this volume of the Minerals Yearbook were prepared by the staffs of the Division of Anthracite, Division of Bituminous Coal, Division of Petroleum, Division of Statistics, Division of Economic Analysis, Division of Accident Prevention and Health, and Assistant Director—Helium.

Charles E. Hennig directed preparation of Crude Petroleum and the related products chapters, and T. W. Hunter directed preparation of the Coal and related products chapters. Preparation of this volume was coordinated by James G. Kirby and Thelma K. Stewart. Graphic presentations were drawn by Karlheinz P. Esser.

Walter G. Messner supplied the detailed data on distribution of natural gas liquids and petroleum products, Paul M. Buttermore supplied the material on water usage, and Richard F. Zaffarano supplied the technology sections for the Natural Gas and Natural Gas Liquids chapters.

World production tables were compiled under the direction of Berenice B. Mitchell from many sources including data from the U.S. Foreign Service, Department of State. Elsie P. Jackson compiled the import and export tables in these chapters from data furnished by the Bureau of the Census, U.S. Department of Commerce.

Other staff members who made important contributions to the individual chapters by assembling and coordinating data and preparing the manuscripts include Marian I. Cooke—Pennsylvania Anthracite; Maxine M. Otero—Coke and Coal Chemicals, Peat, and Fuel Briquets and Packaged Fuel; Ruby J. Phillips—Bituminous Coal and Lignite; Lulie V. Harvey—Carbon Black and Natural Gas, and Nina L. Jones and Mary B. McNair—Employment and injuries.

Because of the many sources of data presented, the Bureau cannot credit each individually but acknowledgment is made to the splendid cooperation of producers and users of fuels, and the business press, trade associations, scientific journals, international organizations and State and Federal agencies who supplied information. State agencies which supplied information used in this volume are listed in the acknowledgment section of Volume III.

WILLIAM C. ELLIOTT, JR.
Chief, Division of Petroleum.

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CONTENTS

	Page
Foreword, by Marling J. Ankeny	III
Acknowledgments, by William C. Elliott, Jr.	V
Review of the mineral-fuel industries in 1963 by Warren E. Morrison and Edward E. Johnson	1
Employment and injuries in the fuel industries, by Forrest T. Moyer	43
Coal and related products:	
Coal—bituminous and lignite, by W. H. Young and R. L. Anderson	49
Coal—Pennsylvania anthracite, by J. A. Vaughn	175
Coke and coal chemicals, by J. A. DeCarlo and E. T. Sheridan	225
Fuel briquets and packaged fuel, by Eugene T. Sheridan	289
Peat, by Eugene T. Sheridan	307
Petroleum and related products:	
Carbon black, by Ivan F. Avery	325
Natural gas, by Ivan F. Avery	337
Natural gas liquids, by I. F. Avery and W. G. Messner	361
Crude petroleum and petroleum products, by James G. Kirby and Betty M. Moore	389
Helium, by Harold W. Lipper	523
Appendix: Tables of measurement	533

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Review of the Mineral-Fuel Industries

By Warren E. Morrison [1] and Edward E. Johnson [2]

Contents

	Page		Page
General Summary	1	Prices and costs	26
Domestic production	3	Income and investment	32
Consumption	9	Research and development	35
Physical stocks	17	Government activities	36
Transportation	17	World review	36
Labor and productivity	21		

GENERAL SUMMARY

INCREASED production and utilization of minerals fuels and power accompanied the overall expansion in U.S. economic activity during 1963, which saw continued advances toward higher production, employment, and purchasing power. During 1963, record levels of wages, profits, and consumption were attained, while costs and prices maintained the stability exhibited throughout most of the recovery period. Expanding industrial production, the average index of which went from 118.3 in 1962 to 124.3 in 1963, narrowed the gap of unused manufacturing capacity to an estimated 5 percent. Gross national product (GNP), another major indicator of economic activity, reached a record level of $583.9 million (current dollars) during the year, this being $27.7 billion, or 4.9 percent above 1962. These achievements were somewhat marred by unemployment, which remained at 5.5 percent of the labor force in 1963, and the continued deficit in the U.S. balance of payments.

Against this general background, total national consumption of energy resources for the year was equivalent to 49,816 trillion British thermal units (Btu), an increase of 4.2 percent over 1962. This represented a somewhat lower rate of growth than for GNP during the year.

About 91 percent of the total consumption of energy resources came from domestic mineral fuels, hydropower, and nuclear power. The remainder, about 9 percent, consisted of imported fuels—mainly crude petroleum, petroleum products, and natural gas. The bulk of energy resources were consumed as fuel and power. There was also a growing demand for the use of energy resources as raw materials

[1] Economist, Division of Economic Analysis.
[2] Economist, Division of Economic Analysis.

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in nonfuel and nonpower uses. Use of raw materials in 1963, including feedstocks for the rapidly expanding petrochemical industry, accounted for about 5 percent of total consumption of energy resources.

Petroleum products including natural gas liquids ranked first in the energy economy in 1963, accounting for 44 percent of total energy consumption. Natural gas was second with 29 percent, followed by bituminous coal, lignite, and anthracite with 30 percent. Hydropower accounted for 4 percent and commercial nuclear power for less than 1 percent of the total. Consumption of energy resources increased in all four of the basic sectors or markets for energy during the year; that is, the household and commercial, industrial, transportation, and electric utilities sectors. Electric utilities, the smallest of the four markets, had the highest rate of growth of fuel consumption, being 6 percent above the 1962 level. Solid fuels, mainly bituminous coal, were the principal fuels for power generation and accounted for about two-thirds of utility fuel consumption during the year. Natural gas ranked second and petroleum third. For some years fuel-burning utility plants have been coal's only major growth market, and in 1963 about half of the national production of bituminous coal went to powerplants. In the industrial sector, the largest of the energy markets, natural gas accounted for 42 percent of the energy resources consumed as fuel. Coal followed with 32 percent and petroleum with 25 percent. Petroleum which predominates in transportation, mainly as gasoline and diesel oil for motor vehicles, accounted for 96 percent of sector demand in 1963. In the household and commercial sector, petroleum products and natural gas contributed 47 percent and 45 percent, respectively, to sector demand mainly for space heating.

Although there was significant expansion in domestic production and consumption of the major mineral fuels in 1963, physical stocks did not vary appreciably during the year. In the transportation of mineral fuels the most significant growth continued to be in pipeline transport of petroleum and natural gas. Natural gas lines have now been extended to all of the continental States except Maine. Despite increased costs in some sectors of the mineral fuels industries during 1963, fuel prices in general continued to maintain their stability, especially in the petroleum and natural gas sectors. Total income from mineral fuels production remained relatively stable in 1963. The largest gain was in income from refining and processing of the products of petroleum and coal, including chemicals which increased 15 percent during the year. Investment in new plant and equipment for petroleum and coal increased about $1 billion. Book value of investment by domestic companies with interests in foreign petroleum also continued to increase, with considerable new petroleum investment in Canada, Germany, and Italy. Expenditures for research and development in the mineral fuels industries continued high during the year, with the greatest portion of total funds coming from company rather than Federal sources. The highest expenditures continued to take place in the chemical sector which includes petrochemicals, and in petroleum refining. Within the Federal Government in 1963 the Bureau of Mines continued work on a number of established programs relating to the conservation and development of mineral resources. A number of technical-economic research projects were carried out during the year relating to mining methods and practices,

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as well as to the production, processing, and utilization of energy resources. Resource investigations were also carried out for a number of mineral fuels to assist in the orderly development and maintenance of adequate supplies.

U.S. foreign trade in mineral fuels did not vary significantly in 1963. The imported 9 percent of energy requirements consisted mainly of crude petroleum, petroleum products, and natural gas. Net imports of petroleum, mainly crude petroleum and residual fuel oil which are subject to controls under the oil imports program, increased slightly during the year. The trend toward higher exports of bituminous coal continued, with increased shipments going primarily to Europe. Solid fuel imports remained small in 1963, coming mainly from Canada. Crude petroleum was shipped to the United States from the Caribbean area, primarily Venezuela, and from Canada and several of the Middle East producing countries. Imported refined products consisted chiefly of residual fuel oil which came mainly from refineries in the Caribbean area. Natural gas was imported from Canada.

Several new tables of interest are included in the review chapter for 1963. Table 7 gives consumption of energy resources by major consumer groups for selected years between 1947 and 1963. Tables 14 and 15 give mileage of petroleum and natural gas pipelines.

DOMESTIC PRODUCTION

Total Energy.—Domestic production of mineral fuels and hydropower in the United States is summarized by major types of energy resources in table 1 (see also figs. 1 and 2). In 1963 total domestic

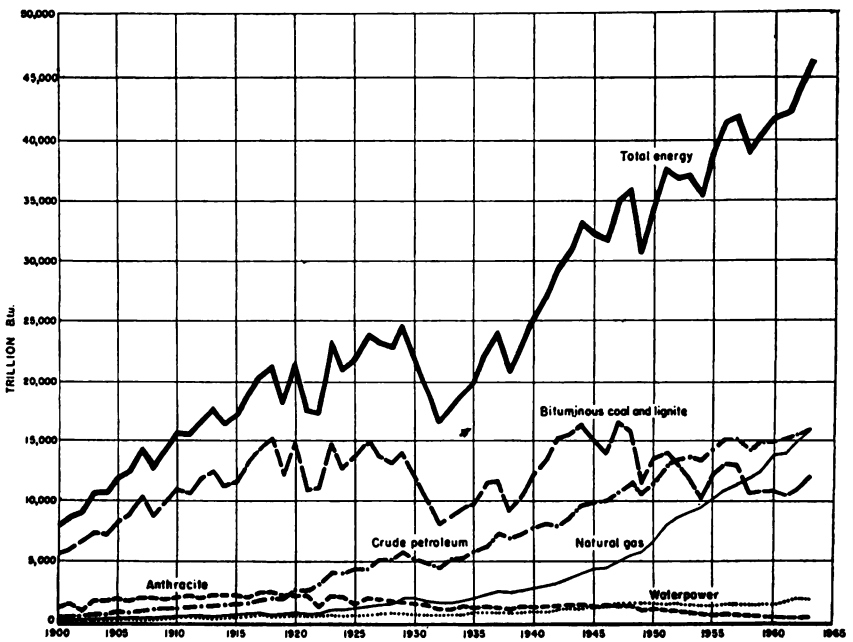

FIGURE 1.—Production of mineral-energy fuels and energy from waterpower in continental United States, 1900–63

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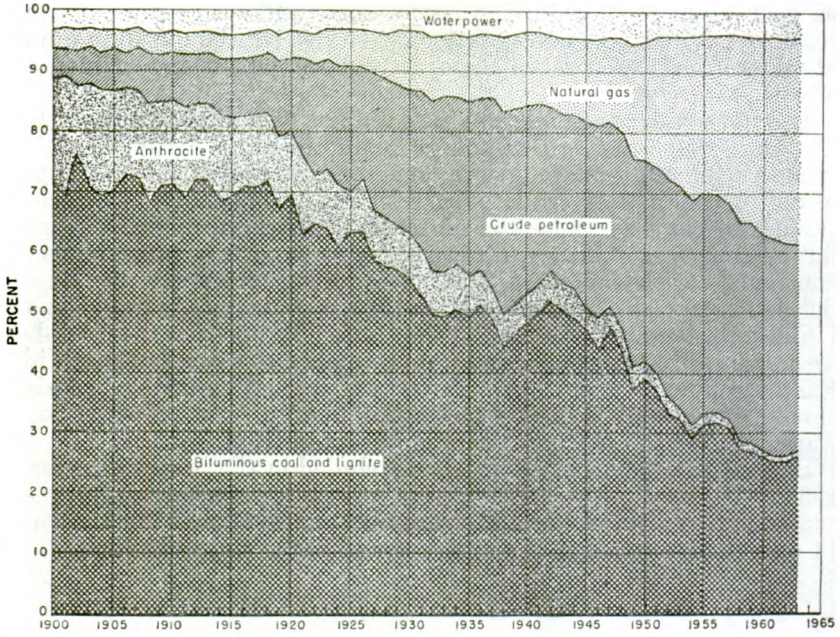

FIGURE 2.—Percentage of total production of British thermal units equivalent of mineral-energy fuels and energy from waterpower in continental United States, 1900–63.

production of energy resources was the equivalent of 46,296 trillion Btu, and 5.4 percent greater than in 1962. Crude petroleum, accounting for one-third of the total energy produced during the year, increased 2.9 percent from the 1962 level. Another third of energy supply in 1963 came from natural gas the output of which expanded 6.3 percent. Under the impact of rising exports and increased domestic demand for coal for electric power generation, output of bituminous coal increased by 8.7 percent, while anthracite interrupted its steady decline since 1956 to show an increase of 8.1 percent. Altogether, domestic coal accounted for one-quarter of total energy output during the year. The contribution of hydropower to total energy remained at about 4 percent in 1963, while nuclear power, commercially significant only since 1957, remained less than 1 percent of the total.

Value of Production.—Total value of mineral fuels produced in recent years is shown in table 2. The value of mineral fuels was 68 percent of production value of all minerals in 1963, and increased at a slightly higher rate during the year than the value of metals and nonmetals. Values of individual fuels produced in 1963 are shown in table 3. The highest value comes from crude petroleum which represented 60 percent of the total for mineral fuels in 1963. Natural gas followed with 17 percent and bituminous coal with 15 percent.

Production of Energy Resources by Type.—Output of selected mineral fuels, by quantity, is also shown in table 3. Except for asphalt and related bitumens the production of which declined slightly in 1963, net gains were reported in output of all major mineral fuels

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for the year. There were significant increases in bituminous coal production which rose 8.7 percent from the previous year, while natural gas was up 6.2 percent and crude petroleum 2.5 percent.

Indexes of Physical Production.—The Bureau of Mines index of the physical volume of mineral production is shown in table 4. The index is for all minerals with separate subgroupings for fuels, metals, and nonmetals. The fuel component of the index reached a record 108.8 in 1963, with the coal segment going to 102.9, the highest level since 1957, and crude oil and natural gas to 110.7, an alltime high. The Federal Reserve Board index of industrial production is shown in table 5. Like the Bureau of Mines index of mineral production, this index is composed of several parts, including coal, oil, gas, and gas liquids. The crude oil-natural gas total in the index includes oil and gas drilling as well as production. To eliminate drilling from this subgrouping, details of crude oil, gas, and gas liquids are shown as separate segments. The index is shown monthly for 1963 on a seasonally adjusted basis. During the year, the largest expansion was in the segment of gas and gas liquids, followed by coal and crude oil.

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TABLE 1.—Production of mineral energy fuels and energy from waterpower in trillion British thermal units and percentage contributed by each in the United States [1]

Year	Bituminous coal and lignite [2]	Anthracite	Crude petroleum	Natural gas, wet	Waterpower	Grand total	Percentage					
							Bituminous coal and lignite	Anthracite	Crude petroleum	Natural gas, wet	Waterpower	Total
1900	5,563	1,457	369	254	250	7,893	70.5	18.4	4.7	3.2	3.2	100.0
1905	8,255	1,973	781	377	386	11,772	70.1	16.8	6.6	3.2	3.3	100.0
1910	10,928	2,146	1,215	547	539	15,375	71.1	14.0	7.9	3.5	3.5	100.0
1915	11,597	2,260	1,630	676	659	16,822	69.0	13.4	9.7	4.0	3.9	100.0
1920	14,899	2,276	2,569	883	738	21,365	69.7	10.7	12.0	4.1	3.5	100.0
1921	10,897	2,298	2,739	732	620	17,286	63.0	13.3	15.9	4.2	3.6	100.0
1922	11,063	1,389	3,234	843	643	17,172	64.5	8.1	18.8	4.9	3.7	100.0
1923	14,792	2,371	4,248	1,113	685	23,209	63.7	10.2	18.3	4.8	3.0	100.0
1924	12,672	2,233	4,141	1,263	648	20,957	60.5	10.6	19.8	6.0	3.1	100.0
1925	13,625	1,570	4,430	1,314	668	21,607	63.1	7.2	20.5	6.1	3.1	100.0
1926	15,020	2,145	4,471	1,452	728	23,816	63.1	9.0	18.8	6.1	3.0	100.0
1927	13,565	2,034	5,227	1,598	776	23,200	58.5	8.8	22.5	6.9	3.3	100.0
1928	13,120	1,914	5,229	1,734	854	22,851	57.4	8.4	22.9	7.6	3.7	100.0
1929	14,017	1,875	5,842	2,118	816	24,668	56.8	7.6	23.7	8.6	3.3	100.0
1930	12,249	1,762	5,208	2,148	752	22,119	55.4	8.0	23.5	9.7	3.4	100.0
1931	10,011	1,515	4,936	1,869	668	18,999	52.7	8.0	26.0	9.8	3.5	100.0
1932	8,114	1,266	4,554	1,729	713	16,376	49.5	7.7	27.8	10.6	4.4	100.0
1933	8,741	1,258	5,253	1,733	711	17,696	49.4	7.1	29.7	9.8	4.0	100.0
1934	9,415	1,452	5,267	1,970	698	18,802	50.1	7.7	28.0	10.5	3.7	100.0
1935	9,756	1,325	5,780	2,136	806	19,803	49.2	6.7	29.2	10.8	4.1	100.0
1936	11,504	1,386	6,378	2,411	812	22,491	51.2	6.1	28.4	10.7	3.6	100.0
1937	11,673	1,317	7,419	2,684	871	23,964	48.7	5.5	31.0	11.2	3.6	100.0
1938	9,132	1,171	7,043	2,565	866	20,777	44.0	5.6	33.9	12.3	4.2	100.0
1939	10,345	1,308	7,337	2,763	838	22,591	45.8	5.8	32.5	12.2	3.7	100.0
1940	12,072	1,308	7,849	2,979	880	25,088	48.1	5.2	31.3	11.9	3.5	100.0
1941	13,471	1,432	8,133	3,162	934	27,132	49.6	5.3	30.0	11.7	3.4	100.0
1942	15,267	1,532	8,043	3,436	1,136	29,414	51.9	5.2	27.3	11.7	3.9	100.0
1943	15,463	1,540	8,733	3,839	1,304	30,879	50.1	5.0	28.3	12.4	4.2	100.0
1944	16,233	1,618	9,732	4,176	1,344	33,103	49.0	4.9	29.4	12.6	4.1	100.0
1945	15,134	1,395	9,939	4,423	1,442	32,333	46.8	4.3	30.7	13.7	4.5	100.0
1946	13,989	1,537	10,057	4,550	1,406	31,539	44.3	4.9	31.9	14.4	4.5	100.0
1947	16,522	1,453	10,771	5,012	1,426	35,184	47.0	4.1	30.6	14.2	4.1	100.0
1948	15,707	1,451	11,717	5,615	1,481	35,971	43.7	4.0	32.6	15.6	4.1	100.0
1949	11,472	1,065	10,683	5,911	1,539	30,690	37.4	3.5	34.8	19.3	5.0	100.0
1950	13,527	1,120	11,449	6,841	1,573	34,510	39.2	3.2	33.2	19.8	4.6	100.0

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1951	13,962	1,084	13,037	8,106	1,569	37,768	27.0	2.9	34.5	21.5	4.1	100.0
1952	12,231	1,031	13,262	8,705	1,581	36,830	28.2	2.8	36.1	23.6	4.3	100.0
1953	11,961	786	13,671	9,116	1,622	37,076	32.3	2.1	36.9	24.6	4.1	100.0
1954	10,262	739	13,427	9,488	1,449	35,365	29.0	2.1	38.0	26.8	4.1	100.0
1955	12,174	665	14,410	10,204	1,447	38,900	31.3	1.7	37.1	26.2	3.7	100.0
1956	13,123	734	15,181	10,930	1,542	41,510	31.6	1.8	36.6	26.3	3.7	100.0
1957	12,909	644	15,178	11,671	1,524	41,826	30.9	1.5	36.3	27.7	3.6	100.0
1958	10,754	538	14,204	11,943	1,693	39,132	27.5	1.4	36.3	30.5	4.3	100.0
1959	10,795	524	14,822	13,036	1,645	40,932	26.4	1.3	36.5	31.8	4.0	100.0
1960	10,886	478	14,935	13,822	1,723	41,844	26.0	1.2	35.7	33.0	4.1	100.0
1961	10,558	443	15,206	14,336	1,752	42,295	25.0	1.1	35.9	33.9	4.1	100.0
1962	11,034	429	15,522	15,004	1,937	43,926	25.1	1.0	35.3	34.2	4.4	100.0
1963	12,024	464	15,966	15,941	1,901	46,296	25.9	1.0	34.5	34.5	4.1	100.0

[1] The unit heat values employed are: Anthracite, 12,700 Btu per pound; bituminous coal and lignite, 13,100 Btu per pound; petroleum, 5,800,000 Btu per barrel; natural gas, total production ×1,075 Btu per cubic feet minus repressuring vent and waste gas ×1,035 per cubic feet. Waterpower includes installations owned by manufacturing plants and mines, as well as Government and privately owned public utilities. The fuel equivalent of waterpower is calculated from the kilowatt-hours of power produced wherever available, as it is true of all public-utility plants since 1919. Otherwise, the fuel equivalent is calculated from the reported horsepower of installed water wheels, assuming a capacity factor of 20 percent for factories and mines and 40 percent for public utilities.

[2] Alaska included for all years.

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TABLE 2.—Value of mineral production in the United States, by mineral group [1]

(Million dollars)

Mineral groups [2]	1954–58 (average)	1959	1960	1961	1962	1963	Change in 1963 from 1962 (percent)
Metals and nonmetals except fuels:							
Nonmetals	3,211	[3] 3,861	[3] 3,868	[3] 3,946	[3] 4,117	4,813	+4.9
Metals	1,932	1,570	2,022	1,927	1,937	2,006	+3.6
Total	5,143	[3] 5,431	[3] 5,890	[3] 5,873	[3] 6,054	6,324	+4.5
Mineral fuels	11,348	11,950	12,142	12,357	[3] 12,784	13,296	+4.0
Grand total	16,491	[3] 17,381	[3] 18,032	[3] 18,230	[3] 18,838	19,620	+4.2

[1] Includes Alaska and Hawaii.
[2] For details, see table 1 in the chapter "Statistical Summary of Mineral Production" of the 1963 Minerals Yearbook.
[3] Revised figure.

TABLE 3.—Mineral fuels production in the United States

Mineral	1960		1961	
	Short tons (quantity)	Value (thousands)	Short tons (quantity)	Value (thousands)
Asphalt and related bitumens (native):				
Bituminous limestone and sandstone	1,242,874	$3,070	1,558,792	$12,818
Gilsonite	383,037	10,020		
Carbon dioxide, natural (estimated) thousand cubic feet	521,169	99	545,354	82
Coal:				
Bituminous and lignite [1] thousand short tons	415,512	1,950,425	402,977	1,844,563
Pennsylvania anthracite do	18,817	147,116	17,446	140,338
Helium thousand cubic feet	475,179	7,768	551,785	10,263
Natural gas million cubic feet	12,771,038	1,789,970	13,254,025	1,996,241
Natural gas liquids:				
Natural gasoline and cycle products thousand gallons	5,842,507	416,819	6,105,463	412,019
LP gases do	8,444,074	391,566	9,085,465	370,186
Peat	470,889	5,138	531,067	5,036
Petroleum (crude) thousand 42-gallon barrels	2,574,933	7,420,181	2,621,758	7,565,582
Total mineral fuels		12,142,000		[2] 12,357,000
Total all other minerals		[2] 5,890,000		[2] 5,873,000
Grand total, mineral production		[2] 18,032,000		[2] 18,230,000

Mineral	1962		1963	
	Short tons (quantity)	Value (thousands)	Short tons (quantity)	Value (thousands)
Asphalt and related bitumens (native):				
Bituminous limestone and sandstone	1,647,063	$14,601	1,632,645	$8,383
Gilsonite				
Carbon dioxide, natural (estimated) thousand cubic feet	1,144,107	146	1,295,545	178
Coal:				
Bituminous and lignite [1] thousand short tons	422,149	1,891,553	458,928	2,013,309
Pennsylvania anthracite do	16,894	134,094	18,627	153,503
Helium thousand cubic feet	599,519	20,905	627,344	21,957
Natural gas million cubic feet	13,876,622	2,145,301	14,746,663	2,328,030
Natural gas liquids:				
Natural gasoline and cycle products thousand gallons	6,244,522	444,817	6,534,967	439,173
LP gases do	9,409,083	353,334	10,302,250	359,770
Peat	[2] 566,441	5,186	546,621	5,423
Petroleum (crude) thousand 42-gallon barrels	[2] 2,676,189	[2] 7,774,051	2,752,723	7,966,651
Total mineral fuels		[2] 12,784,000		13,296,000
Total all other minerals		6,054,000		6,324,000
Grand total, mineral production		[2] 18,838,000		19,620,000

[1] Includes small quantity of anthracite mined in States other than Pennsylvania.
[2] Revised figure.

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TABLE 4.—Indexes of physical volume of mineral production in the United States, by groups and subgroups [1]

(1957-59=100)

Year	All minerals	Fuels			Metals	Nonmetals
		Total	Coal	Crude oil [2] and natural gas		
1952	92.1	93.8	112.3	88.0	115.8	73.0
1953	93.5	94.6	107.0	90.7	122.4	74.7
1954	89.6	90.5	92.4	89.8	100.3	80.9
1955	98.9	99.0	106.8	96.4	118.2	89.0
1956	104.5	104.8	115.4	101.5	120.4	95.4
1957	104.8	104.6	112.5	102.1	122.1	96.1
1958	95.9	95.9	93.7	96.5	93.3	97.4
1959	99.4	99.6	93.9	101.4	84.5	105.4
1960	102.1	100.3	94.0	102.3	107.5	108.0
1961	102.9	101.2	90.8	[3] 104.6	103.3	110.3
1962	[3] 106.0	[3] 104.0	[3] 94.7	107.0	[3] 106.2	[3] 115.4
1963	110.8	108.8	102.9	110.7	107.6	121.7

[1] For description of index, see Minerals Yearbook 1956, V. 1, Review of the Mineral Industries, pp. 2-5. Indexes for components of the fuels index go back to 1880 (the initial year of the overall index) in Minerals Yearbook 1958, V. II, pp. 9-10.
[2] Does not cover isopentane, LP-gases, and other natural gas liquids.
[3] Revised figure.

TABLE 5.—Indexes of industrial production, mineral fuels, seasonally adjusted [1]

(1957-59=100)

	Total industrial production	Total mining	Coal, oil, and gas	Coal	Crude oil and natural gas		
					Total [2]	Crude oil	Gas and gas liquids
1959	105.6	99.7	99.9	93.2	101.2	101.1	104.4
1960	108.7	101.6	97.9	93.7	101.0	100.9	113.2
1961	109.8	102.6	100.9	90.1	103.1	103.0	116.8
1962	118.3	105.0	103.8	95.3	105.5	105.1	120.4
1963 [3]	124.3	107.8	106.9	102.4	107.9	108.2	128.5
January	119.2	103.0	101.3	95.1	102.6	101.6	125.0
February	120.2	104.7	103.7	96.1	105.3	104.8	124.7
March	121.3	105.4	103.9	93.9	105.9	104.9	126.0
April	122.5	107.4	106.1	100.8	107.2	107.3	124.5
May	124.5	108.9	108.1	104.5	108.8	109.5	129.5
June	125.5	109.3	108.6	107.1	108.9	109.5	129.2
July	125.7	110.2	109.8	107.1	110.3	110.9	131.5
August	125.1	111.2	110.7	108.0	111.3	111.7	131.8
September	125.4	109.9	109.3	106.2	109.9	109.8	131.2
October	125.9	108.6	107.7	104.1	108.4	109.1	127.0
November	126.1	107.4	106.3	102.1	107.2	108.1	129.0
December	126.8	107.0	105.7	103.4	106.2	106.6	130.8

[1] Index rebased with 1957-59=100.
[2] Total also includes oil and gas drilling.
[3] Preliminary figure.

Source: Board of Governors of Federal Reserve System, Industrial Production, 1957-59 Base and Industrial Production Indexes for 1963.

Consumption

Consumption by Major Sources of Energy.—Calculated consumption of commercial energy from energy fuels and hydropower for a series of years is shown in table 6. During 1963, total gross consumption of energy by source or type reached the equivalent of 49,786 trillion Btu, an alltime high and an increase of 4.2 percent from 1962. With the addition of 31.1 trillion Btu of nuclear power produced for

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commercial purposes during 1963, total gross energy consumption for the year was 49,817 trillion Btu. Except for anthracite and hydropower, there were increases in consumption for all the major sources of energy during 1963. Demand for crude petroleum, the ranking source, increased 3.3 percent. But the largest gain both absolute and by percentage was in dry natural gas, which expanded 5.8 percent and accounted for 40 percent of the total increase in energy consumption for the year. Bituminous coal continuing its upward trend was 5.5 percent above 1962, coal's largest annual gain since 1954.

Consumption by Major Consuming Sectors.—Energy consumption by major consuming sectors for selected years is shown for the first time in table 7. The data highlight the changing demand for energy by end use and the degree of competition among the various energy resources. Table 7 covers 9 selected years between 1947 and 1963, and shows consumption of energy within the four major consuming sectors or markets for energy; that is, household and commercial, industrial, transportation, and electric utilities. Utilities include conventional fuel-burning plants, hydroelectric plants, and nuclear powerplants. The "miscellaneous and unaccounted for" category in the table represents that portion of gross energy consumption by source that cannot be distributed among the various consuming sectors. Further refinement of the end use data shown in table 7, including a breakdown of consumption of energy resources by fuel and power use and raw material uses including petrochemicals, is shown in Bureau of Mines Information Circular No. 8242, "Summary Energy Balances for the United States—Selected Years 1947-62."

In 1963, demand for energy resources with the household and commercial sector, mainly space heating, amounted to 22 percent of total energy consumed. Petroleum accounted for about half of sector demand. But natural gas, a close second, has a faster rate of growth and is expected to overtake petroleum in the near future. The ascendancy of natural gas in the household and commercial sector has been very rapid, with an average annual growth rate of about 10 percent between 1947 and 1963. The inroads of gas have been especially heavy in the space-heating market. There is some indication that gas expansion in this sector is leveling off, since in 1963 the increase from the previous year was only 3.6 percent.

The largest of the energy markets is still the industrial sector. While accounting for 32 percent of the total energy resources consumed in 1963, industry has had the slowest rate of growth of the four markets, about 1.5 percent between 1947 and 1963. The annual increase between 1962 and 1963, however, was 5.7 percent. It should also be noted that a large portion of expanding utility output goes to industrial users who prefer utility power to self-generated power from conventional fuels. Ranking first as a source of energy in industrial use is natural gas which accounted for 43 percent of sector use in 1963. Bituminous coal followed with 32 percent and petroleum with 25 percent. About 15 percent of petroleum consumption in this sector went into raw material uses including petrochemical feedstocks. In transportation, the demand for energy resources increased at an annual rate of 1.75 percent between 1947 and 1963, and during the latter year this sector accounted for about one-quarter of total

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gross energy consumption. More than three-quarters of sector demand is supplied by oil products, the largest component of which is motor gasoline.

Utility power, the smallest of the four energy markets, accounted for about one-fifth of total energy resources consumed during 1963. Utility generation, however, has had the fastest rate of growth, with the demand for energy resources at powerplants increasing at an average annual rate of 5 percent between 1947 and 1963. During the latter year about three-quarters of the total utility demand for energy resources came from conventional fuel-burning plants. The balance consisted of theoretical resource inputs required to achieve the reported net output of energy at hydroplants. Nuclear power, which has been of commercial significance only since 1957, accounted for less than 1 percent of utility power in 1963.

About two-thirds of all fuel consumed at fuel-burning utilities in 1963 was bituminous coal. Powerplants have been coal's only major growth market during the last decade, and in 1963 about half of the total production of bituminous coal went to this use. Natural gas constituted only about one-fifth of powerplant fuel use in 1963. But gas has the fastest rate of growth among the fuels used for power generation, increasing between 1947 and 1963 at an average annual rate of 11.75 percent. During 1963, gas' increase from the previous year was 9 percent. Use of petroleum products in utility generation, mainly residual fuel oil, was only 7 percent of utility fuel consumption in 1963. In certain regions and particularly on the east coast, use of residual fuel oil for utility generation is higher than the national average.

Apparent consumption of major mineral fuels and related products is shown in physical quantities in table 8. A further breakdown of the demand for fuel oil and natural gas by major consumer groups is shown in table 9, and for bituminous coal and lignite in table 10. Electricity sales by regions and by major consuming sectors are shown in table 11. National electricity sales in 1962 exceeded the previous year by 8 percent, with expansion divided about equally between residential and industrial commercial sales. By volume, sales in the industrial-commercial sector were 2.4 times greater than residential sales for the year. The East North Central region of the United States was the largest electricity-consuming region in 1962 with about one-fifth of total sales. Next in importance were the Pacific region, including Alaska and Hawaii, and the South and Middle Atlantic regions.

Projections.—Projections for a number of selected mineral fuels and related economic trends are shown in table 12. Growth rates shown to the year 1975 are based on the year 1960. Actual rates of increase for 1960–63 are shown for comparison with the projections. Because of the short time period involved the significance of a comparison between actual and projected growth rates is limited. It is interesting to note, however, that only natural gas and coal differ appreciably in the 15-year projections and actual rates of growth for the 3-year period. The projection for natural gas assumes a leveling off of expansion of gas demand for space heating by 1975. The projection for coal assumes a continuing expansion of demand at utility powerplants and some further growth in exports.

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TABLE 6.—Calculated consumption of energy fuels and energy from waterpower in trillion British thermal units and percentage contributed by each in the United States [1]

Year	Bituminous coal and lignite	Anthracite	Crude oil	Petroleum products net: E, exported; I, imported	Natural gas dry	Natural gas liquids	Water-power	Grand total	Percentage							
									Bituminous coal and lignite	Anthracite	Crude oil	Petroleum products net: E, exported; I, imported	Natural gas dry	Natural gas liquids	Water-power	Total
1920	13,325	2,179	3,027	E 393	827	42	775	19,782	67.4	11.0	15.3	E 2.0	4.2	0.2	3.9	100.0
1921	10,266	2,082	3,016	E 342	682	50	656	16,410	62.6	12.7	18.4	E 2.1	4.1	.3	4.0	100.0
1922	11,185	1,443	3,390	E 319	785	56	675	17,215	65.0	8.4	19.7	E 1.9	4.6	.3	3.9	100.0
1923	13,598	2,208	4,419	E 389	1,032	90	727	21,685	62.7	10.2	20.4	E 1.8	4.8	.4	3.3	100.0
1924	12,681	2,050	4,228	E 464	1,170	103	685	20,453	62.0	10.0	20.7	E 2.3	5.7	.5	3.4	100.0
1925	13,079	1,627	4,641	E 485	1,212	124	701	20,899	62.6	7.8	22.2	E 2.3	5.8	.6	3.3	100.0
1926	13,954	1,961	4,876	E 545	1,335	149	765	22,495	62.0	8.7	21.7	E 2.4	5.9	.7	3.4	100.0
1927	13,095	1,897	5,027	E 650	1,465	179	815	21,828	60.0	8.7	23.0	E 3.0	6.7	.8	3.8	100.0
1928	13,069	1,871	5,474	E 711	1,588	200	890	22,381	58.4	8.4	24.4	E 3.2	7.1	.9	4.0	100.0
1929	13,612	1,815	5,894	E 600	1,942	246	847	23,756	57.3	7.6	24.8	E 2.5	8.2	1.0	3.6	100.0
1930	11,921	1,718	6,148	E 496	1,969	243	785	22,288	53.5	7.7	27.6	E 2.2	8.8	1.1	3.5	100.0
1931	9,743	1,484	5,304	E 339	1,715	200	692	18,799	51.8	7.9	28.2	E 1.8	9.1	1.1	3.7	100.0
1932	8,041	1,283	4,830	E 240	1,594	158	726	16,392	49.1	7.8	29.5	E 1.5	9.7	1.0	4.4	100.0
1933	8,323	1,260	5,143	E 299	1,600	144	729	16,900	49.2	7.5	30.4	E 1.8	9.5	.9	4.3	100.0
1934	9,008	1,410	5,136	E 318	1,819	161	721	17,937	50.2	7.9	28.6	E 1.8	10.2	.9	4.0	100.0
1935	9,336	1,298	5,799	E 300	1,974	169	831	19,107	48.9	6.8	30.4	E 1.6	10.3	.9	4.3	100.0
1936	10,697	1,351	6,426	E 302	2,221	184	841	21,418	49.9	6.3	30.0	E 1.4	10.4	.9	3.9	100.0
1937	11,286	1,280	7,004	E 400	2,468	208	905	22,751	49.6	5.6	30.8	E 1.7	10.8	.9	4.0	100.0
1938	8,811	1,148	6,921	E 456	2,348	209	899	19,880	44.3	5.8	34.8	E 2.3	11.8	1.1	4.5	100.0
1939	9,854	1,262	7,327	E 486	2,539	221	872	21,589	45.6	5.9	33.9	E 2.2	11.8	1.0	4.0	100.0
1940	11,290	1,245	7,662	E 175	2,726	243	917	23,908	47.2	5.2	32.1	E .7	11.4	1.0	3.8	100.0
1941	12,893	1,338	8,343	E 139	2,851	364	975	26,625	48.4	5.0	31.3	E .5	10.7	1.4	3.7	100.0
1942	14,149	1,435	7,987	E 320	3,102	367	1,177	27,897	50.7	5.2	28.6	E 1.1	11.1	1.3	4.2	100.0
1943	15,557	1,450	8,538	E 310	3,481	379	1,347	30,442	51.1	4.8	28.1	E 1.0	11.4	1.2	4.4	100.0
1944	15,447	1,509	9,923	E 662	3,775	442	1,387	31,821	48.5	4.7	31.2	E 2.1	11.9	1.4	4.4	100.0
1945	14,661	1,311	10,199	E 580	3,973	491	1,486	31,541	46.5	4.2	32.3	E 1.8	12.6	1.5	4.7	100.0
1946	13,110	1,369	10,270	E 283	4,089	493	1,446	30,494	43.0	4.5	33.7	E .9	13.4	1.6	4.7	100.0
1947	14,302	1,224	11,065	E 262	4,518	564	1,459	32,870	43.5	3.7	33.7	E .8	13.8	1.7	4.4	100.0
1948	13,622	1,275	12,085	E 147	5,033	619	1,507	33,994	40.1	3.8	35.5	E .4	14.8	1.8	4.4	100.0
1949	11,673	958	11,402	I 57	5,289	660	1,565	31,604	36.9	3.0	36.1	I .2	16.7	2.1	5.0	100.0

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1950	11,900	1,013	12,304	I 402	6,150	793	1,601	34,153	34.8	3.0	36.0	I 1.2	18.0	2.3	4.7	100.0
1951	12,285	940	13,867	I 107	7,248	874	1,592	36,913	33.3	2.5	37.6	I .3	19.6	2.4	4.3	100.0
1952	10,971	897	14,248	I 123	7,760	904	1,614	36,576	30.0	2.4	38.0	I .4	21.2	2.6	4.4	100.0
1953	11,182	711	14,912	I 180	8,156	1,006	1,550	37,697	29.7	1.9	39.5	I .5	21.6	2.7	4.1	100.0
1954	9,512	663	14,530	I 260	8,554	1,042	1,479	36,360	26.2	1.9	40.8	I .7	22.5	2.8	4.1	100.0
1955	11,104	599	15,956	I 372	9,232	1,196	1,497	39,956	27.8	1.5	39.9	I .9	23.1	3.0	3.8	100.0
1956	11,338	610	16,994	I 424	9,834	1,209	1,598	42,007	27.0	1.4	40.5	I 1.0	23.4	2.9	3.8	100.0
1957	10,838	528	16,960	I 368	10,416	1,242	1,568	41,920	25.8	1.3	40.5	I .9	24.8	3.0	3.7	100.0
1958	9,607	453	16,308	I 1,120	10,995	1,240	1,740	41,493	23.1	1.2	39.3	I 2.7	26.5	3.0	4.2	100.0
1959	9,696	478	16,994	I 1,313	11,991	1,348	1,691	43,411	22.1	1.1	39.2	I 3.0	27.6	3.1	3.9	100.0
1960	9,967	447	17,172	I 1,436	12,736	1,427	1,775	44,960	22.2	1.0	38.2	I 3.2	28.3	3.2	3.9	100.0
1961	9,809	404	17,372	I 1,617	13,228	1,498	1,777	45,705	21.5	.9	38.0	I 3.5	28.9	3.3	3.9	100.0
1962	10,160	363	17,553	I 1,809	14,027	1,605	1,943	47,780	21.2	.8	37.3	I 3.8	29.4	3.4	4.1	100.0
1963	10,722	361	18,434	I 1,828	14,843	1,688	1,910	49,786	21.6	.7	37.0	I 3.7	29.8	3.4	3.8	100.0

[1] The heat values employed are: Anthracite, 12,700 Btu per pound; bituminous coal and lignite, 13,100 Btu per pound; crude oil, 5,800,000 Btu per barrel; weighted average British thermal units on petroleum products by using 5,248,000 gasoline, 5,670,000 kerosine, 5,825,000 distillate, 6,287,000 residual, 6,064,800 lubricants, 5,537,280 wax, 6,636,000 asphalt, and 5,796,000 miscellaneous; natural gas dry, 1,035 Btu per cubic foot; natural gas liquids weighted average British thermal units based on production; natural gasoline 110,000 Btu per gallon, and LP-gas 95,500 Btu per gallon. Waterpower converted to coal equivalent at the prevailing rate of pounds of coal per kilowatt-hour each year at central electric stations.

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TABLE 7.—U.S. gross consumption of energy resources by major sources and consuming sectors, selected years 1947–63[1]

(Trillion Btu)

Consuming sectors	Anthracite	Bituminous and lignite	Natural gas, dry[2]	Petroleum[3]	Hydropower[4]	Nuclear[4]	Total gross energy
Household and commercial:							
1947	812.8	2,585.5	1,125.0	2,250.9	----------	----------	6,774.2
1950	660.4	2,252.5	1,641.7	3,038.1	----------	----------	7,592.7
1953	457.2	1,614.8	2,293.7	3,391.2	----------	----------	7,756.9
1955	330.7	1,443.7	2,849.5	4,001.0	----------	----------	8,624.9
1957	271.0	981.3	3,390.9	4,068.6	----------	----------	8,711.8
1959	192.2	814.9	4,023.8	4,718.6	----------	----------	9,749.5
1961	128.8	782.9	4,476.8	5,028.1	----------	----------	10,416.6
1962	121.1	798.6	4,849.2	5,227.1	----------	----------	10,996.0
1963	103.0	671.0	5,026.8	5,257.8	----------	----------	11,058.6
Industrial:							
1947	284.7	7,013.6	2,874.7	2,489.7	----------	----------	12,662.7
1950	127.0	5,830.4	3,546.5	2,641.5	----------	----------	12,145.4
1953	48.3	6,056.9	4,303.5	3,092.0	----------	----------	13,500.7
1955	52.7	5,796.1	4,675.0	3,329.2	----------	----------	13,853.0
1957	66.3	5,792.4	5,118.1	3,477.8	----------	----------	14,454.6
1959	54.9	4,691.8	5,689.8	3,458.1	----------	----------	13,894.6
1961	46.2	4,693.7	6,024.7	3,683.1	----------	----------	14,446.7
1962	49.0	4,761.6	6,293.2	3,879.7	----------	----------	14,983.5
1963	56.7	5,014.6	6,775.9	3,994.0	----------	----------	15,841.2
Transportation:[5]							
1947	23.9	3,006.2	(neg)	5,760.5	----------	----------	8,790.6
1950	19.6	1,681.3	129.9	6,785.0	----------	----------	8,615.8
1953	12.7	796.3	238.4	8,157.8	----------	----------	9,205.2
1955	11.6	462.1	253.8	9,109.3	----------	----------	9,836.8
1957	9.2	268.3	309.7	9,649.0	----------	----------	10,236.2
1959	7.4	99.8	361.6	9,923.1	----------	----------	10,391.9
1961	(neg)	21.7	390.8	10,575.2	----------	----------	10,987.7
1962	(neg)	19.5	395.8	11,000.9	----------	----------	11,416.2
1963	(neg)	19.1	438.6	11,506.1	----------	----------	11,963.8
Electricity generation, utilities:[6]							
Fuel burning plants:							
1947	89.5	1,994.4	386.1	468.0	----------	----------	2,938.0
1950	91.7	2,135.9	650.9	662.2	----------	----------	3,540.7
1953	91.4	2,714.1	1,070.4	577.1	----------	----------	4,453.0
1955	81.5	3,402.1	1,193.6	512.2	----------	----------	5,189.4
1957	85.4	3,796.1	1,384.9	512.4	----------	----------	5,778.8
1959	67.0	3,989.4	1,684.0	545.9	----------	----------	6,286.3
1961	63.7	4,311.1	1,889.2	577.0	----------	----------	6,841.0
1962	58.2	4,580.0	2,034.4	579.0	----------	----------	7,251.6
1963	54.7	5,016.9	2,217.9	599.8	----------	----------	7,889.3
Hydropower and nuclear plants:							
1947	----------	----------	----------	----------	1,459.0	----------	1,459.0
1950	----------	----------	----------	----------	1,601.0	----------	1,601.0
1953	----------	----------	----------	----------	1,550.0	----------	1,550.0
1955	----------	----------	----------	----------	1,497.0	----------	1,497.0
1957	----------	----------	----------	----------	1,568.0	1.2	1,569.2
1959	----------	----------	----------	----------	1,695.0	11.7	1,706.7
1961	----------	----------	----------	----------	1,777.0	19.2	1,796.2
1962	----------	----------	----------	----------	1,943.0	25.9	1,968.9
1963	----------	----------	----------	----------	1,910.0	31.1	1,941.1
Miscellaneous and unaccounted for:							
1947	13.3	----------	132.6	397.9	----------	----------	543.8
1950	114.8	----------	181.0	362.2	----------	----------	658.0
1953	101.6	----------	250.0	879.9	----------	----------	1,231.5
1955	122.9	----------	260.1	572.3	----------	----------	955.3
1957	96.4	----------	212.6	862.2	----------	----------	1,171.2
1959	156.0	----------	231.1	1,101.3	----------	----------	1,488.4
1961	165.1	----------	446.5	624.6	----------	----------	1,236.2
1962	134.9	----------	454.4	580.3	----------	----------	1,169.6
1963	146.2	----------	383.8	592.3	----------	----------	1,122.3
Total gross energy:[6]							
1947	1,224.2	14,599.7	4,518.4	11,367.0	1,459.0	----------	33,168.3
1950	1,013.5	11,900.1	6,150.0	13,489.0	1,601.0	----------	34,153.6
1953	711.2	11,182.1	8,156.0	16,098.0	1,550.0	----------	37,697.3
1955	599.4	11,104.0	9,232.0	17,524.0	1,497.0	----------	39,956.4
1957	528.3	10,838.1	10,416.2	18,570.0	1,568.0	1.2	41,921.8
1959	477.5	9,595.9	11,990.3	19,747.0	1,695.0	11.7	43,517.4
1961	403.8	9,809.4	13,228.0	20,487.0	1,777.0	19.2	45,724.4
1962	363.2	10,159.7	14,027.0	21,267.0	1,943.0	25.9	47,785.8
1963	360.6	10,721.6	14,843.0	21,950.0	1,910.0	31.1	49,816.3

See footnotes on p. 15.

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TABLE 7.—Footnotes

[1] Gross energy is that contained in all types of commercial energy at the time it is incorporated in the economy, whether the energy is produced domestically or imported. Gross energy comprises inputs of primary fuels (or their derivatives), and outputs of hydropower and nuclear power converted to theoretical energy inputs. Gross energy includes the energy used for the production, processing, and transporation of energy proper.
[2] Excludes natural gas liquids.
[3] Petroleum products including still gas, liquefied refinery gas, and natural gas liquids.
[4] Represents outputs of hydropower and nuclear power converted to theoretical energy inputs at the prevailing rate of pounds of coal per kilowatt-hour at central electric stations. Excludes inputs for power generated by nonutility plants, which are included within the other consuming sectors.
[5] Includes bunkers and military transportation.
[6] Years 1947–57 on a 48-State basis; 1959–63 on a 50-State basis (including Alaska and Hawaii).

Source: Data for selected years 1947–62 are from Bureau of Mines Information Circular 8242, "Summary Energy Balances for the United States—Selected Years 1947–62."

TABLE 8.—Apparent consumption of mineral fuels and related products

Commodity		1962	1963	Percent change from 1962
Fuels:				
Bituminous coal	million net tons	387.8	409.2	+5.5
Crude petroleum, runs to stills	millions of barrels	3,069.6	3,170.7	+3.3
Natural gas	million cubic feet	13,890.1	14,640.5	+5.4
Anthracite	million net tons	[1] 14.3	14.2	−.7
Products:				
All oils, domestic demands	million barrels	[1] 3,735.6	3,854.5	+3.2
Coke	million net tons	51.8	55.0	+6.2
Petroleum asphalt	do	20.7	21.3	+2.8

[1] Revised figure.

TABLE 9.—Sales of fuel oil and natural gas in the United States, by major consumer groups

(Fuel oil—thousand barrels; natural gas—billion cubic feet)

Product and year	Railroads	Vessels	Gas and electric powerplants	Smelters, mines, and manufacturers	Space heating and cooking	Military	Oil company fuel	Miscellaneous	Total
Distillate fuel oil:									
1962	86,803	15,836	4,100	34,951	466,830	13,041	9,055	98,479	729,095
1963	88,117	15,148	4,149	36,647	465,315	13,436	10,253	115,059	748,124
Residual fuel oil:									
1962	5,501	84,415	88,261	156,221	125,164	35,667	45,978	7,226	548,433
1963	5,342	76,502	91,615	149,269	125,248	36,444	46,976	7,126	538,522
Natural gas:									
1962	------	------	1,966	[1] 4,073	[1] 4,739	------	3,166	------	[1] 13,944
1963	------	------	2,143	4,346	4,857	------	3,295	------	14,641

[1] Revised figures.

TABLE 10.—Consumption of bituminous coal and lignite in the United States, by major consumer groups

(Thousand net tons)

Year	Electric power utilities	Class I railroads	Coke plants	Steel and rolling mills	Cement mills	Other mining and manufacturing industries	Retail deliveries to other consumers	Bunkers, foreign and lake vessels	Total
1959	165,788	2,600	79,181	6,674	8,510	73,396	29,138	969	366,256
1960	173,882	2,101	81,015	7,378	8,216	76,487	30,405	945	380,429
1961	179,629	(1)	73,881	7,495	7,615	77,280	27,735	770	374,405
1962	190,833	(1)	74,262	7,319	7,719	78,766	28,188	687	387,774
1963	209,038	(1)	77,633	7,401	8,138	82,797	23,548	670	409,225

[1] Canvass discontinued.

Source: Data for electric power utilities are from Federal Power Commission; data for class I railroads are from Association of American Railroads; and data for bunkers, foreign and lake vessels are from Bureau of the Census.

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TABLE 11.—Electrical energy sales to ultimate customers

(Million kilowatt-hours)

Region	1957			1958			1959		
	Total consumption	Residential [1]	Industrial and commercial	Total consumption	Residential [1]	Industrial and commercial	Total consumption	Residential [1]	Industrial and commercial
New England	21,982	7,586	13,677	22,573	8,149	13,644	24,790	8,701	15,237
Middle Atlantic	89,342	23,863	59,480	89,626	25,466	57,925	98,021	27,401	63,706
East North Central	124,872	32,605	87,173	125,797	34,548	85,820	139,596	37,393	96,380
West North Central	33,508	13,828	18,504	34,717	14,673	18,829	38,157	16,106	20,780
South Atlantic	65,609	21,913	41,646	69,817	24,446	43,181	77,763	26,648	48,676
East South Central	79,126	13,427	64,986	78,794	14,943	63,102	84,015	16,437	66,781
West South Central	43,588	12,252	29,095	46,419	13,729	30,275	51,612	15,220	33,766
Mountain	22,748	6,811	14,780	23,714	7,288	15,209	26,010	8,105	16,541
Pacific	77,054	26,064	48,535	77,704	26,889	48,251	86,779	30,390	53,617
Total United States	557,829	158,349	377,876	569,161	170,131	376,236	626,743	186,401	415,484
	1960			1961 [2]			1962 [2]		
New England	26,570	9,213	16,434	28,652	10,140	17,432	30,558	10,738	18,655
Middle Atlantic	106,013	28,594	69,534	112,080	30,785	73,095	119,026	32,051	78,368
East North Central	147,088	39,541	102,033	151,885	41,748	104,358	162,756	44,046	112,397
West North Central	44,176	17,368	25,419	46,415	18,402	26,260	51,257	20,384	28,954
South Atlantic	86,388	29,368	54,334	93,274	32,129	57,601	102,766	34,915	63,918
East South Central	87,543	18,504	68,049	88,821	19,075	68,736	92,624	21,172	70,288
West South Central	57,363	17,290	37,013	60,399	17,331	39,831	68,930	20,412	45,069
Mountain	29,611	8,947	19,353	33,514	8,538	22,430	35,897	9,192	25,080
Pacific [3]	98,447	33,884	61,129	105,688	30,873	71,548	112,274	33,504	75,282
Total United States [3]	683,199	202,709	453,298	720,728	209,021	482,291	776,088	226,414	518,011

[1] Includes rural.
[2] Rural included in all three classes.
[3] Includes Alaska and Hawaii in 1960, 1961, and 1962.

Source: Edison Electric Institute, Statistical Yearbook of the Electric Utility Industry, 1957 to 1962.

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TABLE 12.—Projections: Mineral fuels and economic trends

	1960 actual	1963 actual	Growth rate 1960–63	1975 projection	1960–75 projected growth rate (percent per year)
Population.....thousands..	180,676	189,278	1.6	[1] 235,275	1.8
Labor force.....do....	73,126	75,712	1.2	[2] 93,031	1.7
Gross national product..billions of 1954 dollars..	[3] 440	493	3.8	[4] 728	3.4
Index of industrial production (1957–59=100)..	[3] 108	124	4.6	[4] 180	3.4
Energy consumption—U.S.....trillion Btu..	44,960	49,816	3.5	[5] 70,404	3.0
Petroleum consumption (inc. natural gas liquids).....million barrels..	[3] 3,567	3,855	2.6	[5] 4,896	2.1
Natural gas consumption...billion cubic feet..	12,509	14,641	5.4	[5] 19,985	3.2
Coal consumption.....million tons..	398	423	2.1	725	4.1
Electrical energy consumption million kilowatt hours..	849,006	1,007,897	5.7	[6] 2,256,000	6.8

[1] Bureau of the Census, Current Population Reports, p. 25, No. 215.
[2] Bureau of Labor Statistics.
[3] Revised figure.
[4] Staff, Bureau of Mines, Mineral Facts and Problems. Bulletin 585, 1960, 1016 pp.
[5] T. Reed Scollon. Trends in Utilization of Energy Resources in the United States. Presented at World Power Conference, Melbourne, Australia, October 1962, 25 pp.
[6] Federal Power Commission Forecast, Jan. 30, 1962.

PHYSICAL STOCKS

Stock positions of most of the major mineral fuels, shown in table 13, did not vary appreciably during 1963. Despite the considerable advance in domestic production and consumption of bituminous coal, coal stocks increased by only a small margin. Stocks of coke declined for the third year, while petroleum product stocks experienced only mild and for the most part upward fluctuations during the year. Crude petroleum stocks declined 15 million barrels, while natural gas stocks continued to expand as more storage facilities are provided near consuming areas to handle the seasonable peak demand for gas.

TRANSPORTATION

Natural gas and manufactured gas move almost entirely by pipeline, while crude petroleum and refined products utilize at various stages, pipeline, rail, water, and truck transportation. The bulk of solid fuels are shipped by rail, although there is a trend toward increased use of truck and water transportation.

Total pipeline mileage for crude oil and refined products is shown in table 14. At the beginning of 1962, there were 200,543 miles of crude and product lines of which 35 percent was crude trunklines, 27 percent product trunklines, and the remaining 38 percent gathering lines. In the 3 years between 1959 and 1962, product pipelines had the most sustained growth increasing by 8,717 miles. Total pipeline fill in crude and product lines at the beginning of 1962 was 86,176,000 barrels, an increase of 3,963,000 barrels from 1959. Pipeline movements of foreign and domestic crude petroleum to refineries in 1963 totaled 2,368,259,000 barrels, including intrastate and interstate movements. Pipeline movements of refined petroleum products, mainly gasoline, kerosine, distillate fuel oil, military jet fuel, and natural gas liquids, totaled 1,288,617,000 barrels. Gas pipeline

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mileage is shown in table 15. In 1962 there were 683,230 miles of gas pipelines, of which 97 percent was natural gas, and the remaining 3 percent manufactured gas, mixed gas, and liquefied petroleum gases. About 63 percent of the total gas mileage in 1962 consisted of distribution lines, while 29 percent was transmission lines and the remaining 8 percent field and gathering lines.

About three-quarters of bituminous coal and lignite production in 1963 moved by rail, as shown in table 16. Water and truck movements accounted for the remaining one-quarter. Table 17 shows movements of major mineral fuels by rail. In the first half of 1963, over 90 percent of the mineral fuels that moved by rail were coal and coke, while crude petroleum and refined products made up most of the remainder. In water transportation of mineral fuels, crude petroleum and refined products predominate. As shown in table 18, the latter accounted for about two-thirds of water movements of mineral fuels in 1963, while most of the remainder was solid fuels. Freight

TABLE 13.—Physical stocks of crude mineral fuels at yearend

(Producers' stocks, unless otherwise indicated)

Fuel	1959	1960	1961	1962	1963
Coal and related products: [1]					
Bituminous and lignite [2]—net tons	79,654,678	76,896,317	74,449,230	72,577,910	73,028,665
Coke—do	4,682,436	4,738,088	[3] 4,041,873	3,906,811	2,884,931
Petroleum and related products: [4]					
Carbon black—thousand pounds	218,893	292,982	287,899	[5] 293,434	253,410
Crude petroleum and petroleum products—thousand barrels	808,970	784,558	825,074	[5] 834,296	835,559
Crude petroleum—do	257,129	239,800	244,664	252,011	237,361
Natural gas liquids—do	24,887	28,931	37,067	31,385	33,747
Gasoline—do	187,613	194,774	184,167	[5] 188,683	190,937
Distillate fuel oil—do	151,164	138,455	152,018	[5] 143,961	156,677
Residual fuel oil—do	53,501	44,870	44,869	[5] 49,775	47,538
Petroleum asphalt—do	10,948	12,991	12,999	14,252	14,354
Other refined products—do	123,737	124,737	149,290	[5] 154,229	[5] 154,945
Natural gas [3]—billion cubic feet	1,901	2,184	2,344	2,504	2,745

[1] Series on anthracite stocks in ground storage has been discontinued.
[2] Stocks at industrial, consumer, and retail yards and on upper Lake docks.
[3] American Gas Association.
[4] Stocks of petroleum and related products are calculated on a new basis in 1962 and 1963 due to product reclassification resulting from separately reported data for petrochemical feedstocks.
[5] Revised figure.

TABLE 14.—Mileage of petroleum pipelines in the United States, selected years, 1926–62

(Miles)

Year	Trunklines		Gathering lines	Total
	Crude	Products		
1926	44,470	(1)	45,700	90,170
1931	58,020	(1)	53,640	111,660
1936	57,820	(1)	52,760	110,580
1941	65,180	9,001	53,170	127,351
1950	71,373	20,881	60,560	152,814
1953	75,228	27,236	68,040	170,504
1956	78,594	36,420	73,526	188,540
1959	70,317	44,483	75,182	189,982
1962	70,355	53,200	76,988	200,543

[1] Included in crude lines.

Source: Bureau of Mines, Crude Oil and Product Pipelines, Triennial.

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TABLE 15.—Miles of utility gas main, by type of gas and by type of main, 1945–62 [1]

Type of gas and type of main	1945	1950	1955	1958	1959 [2]	1960 [2]	1961 [2]	1962 [2]
All types:								
Field and gathering	27,000	32,850	45,680	52,010	54,130	55,850	56,730	58,680
Transmission	82,190	113,050	145,970	165,360	174,280	183,660	191,840	196,380
Distribution	201,480	241,570	305,090	354,130	371,420	391,440	410,390	428,170
Total	310,670	387,470	496,740	571,500	599,830	630,950	658,960	683,230
Natural gas:								
Field and gathering	27,000	32,850	45,680	52,010	54,130	55,850	56,730	58,680
Transmission	77,280	109,360	142,490	162,990	172,160	181,770	189,990	194,970
Distribution	113,720	172,270	260,600	325,790	347,660	370,360	390,400	409,910
Total	218,000	314,480	448,770	540,790	573,950	607,980	637,120	663,560
Manufactured gas:								
Field and gathering	0	0	0	0	0	0	0	0
Transmission	3,410	2,230	420	50	30	20	30	20
Distribution	68,590	53,190	11,540	4,410	1,780	1,550	1,480	1,480
Total	72,000	55,420	11,960	4,460	1,810	1,570	1,510	1,500
Mixed gas:								
Field and gathering	0	0	0	0	0	0	0	0
Transmission	1,480	1,370	2,990	2,250	2,070	1,860	1,810	1,380
Distribution	17,180	10,620	28,450	20,830	19,510	17,590	16,640	15,080
Total	18,660	11,990	31,440	23,080	21,580	19,450	18,450	16,460
Liquified petroleum gas:								
Field and gathering	0	0	0	0	0	0	0	0
Transmission	20	90	70	70	20	10	10	10
Distribution	1,990	5,490	4,500	3,100	2,470	1,940	1,870	1,700
Total	2,010	5,580	4,570	3,170	2,490	1,950	1,880	1,710

[1] Excludes service pipe. Data not adjusted to common diameter equivalent. Mileage shown as of end of each year.
[2] Includes data for Hawaii subsequent to 1959 and for natural gas only for Alaska subsequent to 1960.

NOTE: For earlier years please refer to Historical Statistics of the Gas Industry.

Source: American Gas Association, Gas Facts 1962.

TABLE 16.—Methods of shipment of bituminous coal and lignite from mines and used at mines in the United States

Year	Method of shipment from mines			Used at mines [1]	Total production
	Shipped by rail and trucked to rail	Shipped by water and trucked to water	Trucked to final destination		
	Thousand net tons				
1959	300,763	45,954	52,564	12,747	412,028
1960	303,865	46,784	52,699	12,164	415,512
1961	294,494	45,400	51,044	12,039	402,977
1962	307,327	48,107	54,853	11,862	422,149
1963	335,739	48,914	60,901	13,374	458,928
	Percentage of total				
1959	73.0	11.1	12.8	3.1	100.0
1960	73.1	11.3	12.7	2.9	100.0
1961	73.1	11.3	12.6	3.0	100.0
1962	72.8	11.4	13.0	2.8	100.0
1963	73.2	10.6	13.3	2.9	100.0

[1] Includes coal used by mine employees, taken by locomotive tenders at tipples, used at mines for power and heat, transported from mines to point of use by conveyors or trams, made into beehive coke at mines, and all other uses at mines.

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rates for coal, expressed as domestic average revenue per ton, are shown in table 19. In 1963 bituminous coal rates declined to the lowest level since 1955. This may be attributed to the downward pressure on rates caused by interfuel competition in the utility power market, and the fact that most coal is transported to powerplants by rail. Ocean freight rates continued to fluctuate widely in 1963, with a significant increase in the index of dry cargo time charter rates and a slight decline in the index of tanker rates.

TABLE 17.—Rail transportation of mineral fuels and related products in the United States, by products [1]

(Thousand short tons)

Product	1961	1962	First half 1962	First half 1963 [2]	Change first half 1963 from first half 1962 (percent)
Coal:					
Anthracite [3]	14,963	15,157	7,020	7,914	+13
Bituminous	296,884	312,179	154,708	160,223	+4
Coke	14,328	15,467	8,563	8,501	−1
Crude petroleum	2,027	1,756	1,006	376	−63
Gasoline	6,861	6,187	3,116	2,691	−14
Distillate and residual fuel oil	6,369	6,209	3,229	3,200	−1
Asphalt	2,810	2,853	1,057	1,133	+7
Other [4]	15,482	15,824	8,220	8,453	+3
Total	359,724	375,632	186,919	192,491	+3

[1] Revenue freight originated, excluding forwarder and less than carload shipments, for which categories commodity detail is not available.
[2] Second half 1963 not available.
[3] Includes shipments to washeries and breakers.
[4] Lubricants, petroleum products, and gases.

Source: Interstate Commerce Commission, Freight Commodity Statistics, Class I Railroads in United States, for years ended Dec. 31, 1961 and 1962; and quarterly reports, 1962 and 1963.

TABLE 18.—Water transportation of mineral fuels and related products in the in the United States, by products [1]

(Thousand short tons)

Product	1961	1962	1963 [2]	Change from 1962 (percent)
Coal:				
Anthracite	320	[3] 573	423	−26
Bituminous	127,181	[3] 136,765	141,672	+4
Coke	331	686	576	−16
Crude petroleum	78,297	80,970	83,306	+3
Gasoline	91,971	[3] 92,896	98,190	+6
Distillate fuel oil	77,988	[3] 79,001	77,381	−2
Residual fuel oil	44,986	45,215	46,341	+2
Asphalt	4,042	4,760	4,487	−6
Kerosine	9,146	9,314	8,307	−11
Other [4]	13,846	15,263	15,198	0
Total	448,108	[3] 465,443	475,881	+2

[1] Domestic traffic only; traffic with Canal Zone, the Virgin Islands, and military cargoes carried in Defense Department vehicles are excluded.
[2] Preliminary figure.
[3] Revised figure.
[4] Includes lubricants, jet fuel, naphthene, and briquets.

Source: Department of the Army, Waterborne Commerce of the United States, Calendar year 1962, pt. 5, National Summaries.

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TABLE 19.—Freight costs in domestic and international trade

Year	Domestic average revenue per ton (dollars)		Foreign dry cargo (1958=100)	
	Anthracite (n.o.s.)	Bituminous coal	Time charter	Tanker
1956	3.39	3.45	312	113
1957	3.52	3.57	217	118
1958	3.68	3.58	100	100
1959	3.65	3.45	100	90
1960	3.70	3.40	118	81
1961	3.65	3.40	132	76
1962	3.67	3.32	105	73
1963	[1] 3.58	[1] 3.27	123	71

[1] 6 month's average. 1st and 2d quarter reports, 1963. Yearend report not available.

Source: Domestic data are from Interstate Commerce Commission, Bureau of Transport Economics and Statistics. Freight Commodity Statistics, June 1957 to June 1963 and 1st and 2d quarterly reports, 1963. Foreign data are from United Nations Monthly Bulletin of Statistics, March 1964.

LABOR AND PRODUCTIVITY

Employment.—A comparison of data on employment in the mineral-fuel industries from three separate sources is shown in table 20. The Bureau of Mines publishes two sets of employment figures for bituminous coal mines, one based on productivity and another on injury analysis. The Bureau data for bituminous coal employment in table 20 are based on productivity and adjusted for coverage. Bureau employment data for anthracite represents full coverage for both productivity and injury analysis. The Bureau of Labor Statistics (BLS), U.S. Department of Labor, publishes a set of employment data for the mineral-fuel industries based on payroll information. The Bureau of Employment Security (BES), U.S. Department of Labor, publishes a comparable series based on reports to State agencies under unemployment security laws. Generally the three employment series move in the same direction, although on occasion they have differed by a considerable margin. The Bureau of Labor Statistics series was revised in 1963, including the data shown for earlier years. This series is further broken down in table 21 to show mineral fuels employment by major fuels within the mining and manufacturing sectors. These series were also revised in 1963 including the data shown for earlier years.

Productivity.—Prompted by increased mechanization and automation, the productivity of labor in the mineral-fuel industries was further increased during 1963 while absolute levels of employment continued to decline. The Bureau of Labor Statistics series on labor productivity in several manufacturing and mining industries is shown in table 22. Productivity is expressed as indexes in the table in three ways: production per employee, per production worker, and per production worker man-hour. Indexes of productivity are shown for bituminous coal and lignite production, but not for crude oil and natural gas production due to difficulty in defining the labor force involved in the latter producing industries. However, for petroleum an index of labor output at petroleum refineries is shown. Table 22 shows that output per man-hour in petroleum refining in 1962 was 37 percent higher than the 1957–59 average, while bituminous coal

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productivity per man-hour was 22 percent greater than the 1957–59 average. Bureau of Labor Statistics data on average hours and gross earnings in mineral-fuel and related industries are shown in table 23. In 1963, hourly earnings increased in all of the sectors of mining and manufacturing shown in the table.

Labor-Turnover Rates.—Labor-turnover rates in the mineral-fuel and related industries are shown in table 24. In 1963 turnover rates did not fluctuate greatly from 1962 except in coal mining. During the year the coal mining accession rate about equaled the separation

TABLE 20.—Comparison of data on total employment in the mineral-fuel industries

(Thousands)

Year	Petroleum		Bituminous coal			Anthracite		
	BLS data [1]	BES data	BLS data [1]	BES data	Mines data	BLS data [1 2]	BES data	Mines data
1958	327.5	313.2	193.0	192.7	197.3	22.1	23.3	26.5
1959	329.5	313.6	178.5	171.6	179.6	19.7	18.8	23.3
1960	309.2	299.6	168.5	163.2	169.4	17.6	14.9	19.1
1961	303.1	294.1	147.1	145.6	150.5	14.2	12.8	15.8
1962	299.2	289.1	139.8	138.8	143.8	11.9	11.6	14.0
1963	293.4	280.2	127.6	135.5	141.6	11.1	11.2	13.5

[1] BLS series revised.
[2] BLS figure is determined by subtracting bituminous employees from total coal employment.

Source: BLS data from Bureau of Labor Statistics, Employment and Earnings, monthly issues; BES data from Bureau of Employment Security, Employment and Wages, monthly issues.

TABLE 21.—Total employment in the mineral-fuel industries

(Thousands)

Year and month	Mining					Manufacturing		
	Total	Bituminous	Other coal	Crude petroleum and natural gas products	Crude petroleum and natural gas (except contract services) [1]	Total [2] petroleum refining and related industries	Petroleum refining	Other petroleum and coal products
1958	542.6	193.0	22.1	327.5	192.5	223.8	190.4	33.3
1959	527.7	178.5	19.7	329.5	185.4	215.5	181.4	34.1
1960	495.3	168.5	17.6	309.2	178.2	211.9	177.2	34.7
1961	464.4	147.1	14.2	303.1	171.3	201.9	168.4	33.6
1962	450.9	139.8	11.9	299.2	167.4	195.0	160.5	34.5
1963:								
January	437.2	136.6	11.5	289.1	163.4	184.8	152.1	32.7
February	435.1	135.8	11.5	287.8	163.1	185.6	153.7	31.9
March	429.8	130.5	11.2	288.1	162.3	185.7	154.3	31.4
April	432.5	131.9	10.9	289.7	162.9	187.0	153.6	33.4
May	436.5	130.5	11.0	295.0	163.0	188.9	153.4	35.5
June	439.1	128.0	10.8	300.3	166.3	190.4	152.0	36.5
July	428.1	114.5	11.4	302.2	167.5	191.1	152.4	36.7
August	433.0	124.5	10.6	297.9	166.5	193.1	153.0	37.3
September	429.5	123.8	10.7	295.0	163.3	191.0	154.6	36.4
October	425.5	125.0	11.0	289.5	161.6	188.8	155.8	35.8
November	427.6	124.8	11.3	291.5	161.2	186.8	154.4	34.4
December	432.1	125.8	11.3	295.0	161.6	184.5	153.9	32.5
Average, 1963	432.1	127.6	11.1	293.4	163.6	188.1	153.6	34.5

[1] Not included in total because data are also included with crude petroleum and natural gas production.
[2] Standard Industrial Classification Industry 295, paving and roofing materials included in total.

Source: Bureau of Labor Statistics, Employment and Earnings Statistics, Bulletin No. 1312-1, 1963, and monthly reports, September 1963 to March 1964.

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rate, in contrast to 1962 when separations exceeded accessions. There was also a decline in the layoff rate in coal mining in 1963. The change in coal mining turnover during 1963 may be attributed to the continuing increase in bituminous coal production and consumption.

TABLE 22.—Index of labor output [1]

(1957-59=100)

Year	Petroleum refining			Bituminous coal and lignite mining		
	Employee	Production worker	Production worker man-hour	Employee	Production worker	Production worker man-hour
1953-57 (average)	87.7	86.5	84.7	89.0	85.9	84.7
1958	97.4	97.2	103.2	97.2	97.7	103.2
1959	109.5	109.6	106.3	105.6	107.8	106.4
1960	113.6	115.2	114.2	112.8	116.3	109.7
1961	120.6	122.8	127.2	125.3	129.9	114.4
1962 [2]	130.2	133.3	136.9	137.9	143.0	122.0

[1] Revised series.
[2] Preliminary.

Source: Indexes of Output per Man-hour for Selected Industries, 1939 and 1947-62, Bureau of Labor Statistics.

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TABLE 23.—Average hours and gross earnings of production workers in the mineral fuels and related industries

Year and month	Mining											
	Total fuels [1]			Total coal mining			Bituminous coal			Crude petroleum and natural gas		
	Weekly earnings	Weekly hours	Hourly earnings	Weekly earnings	Weekly hours	Hourly earnings	Weekly earnings	Weekly hours	Hourly earnings	Weekly earnings	Weekly hours	Hourly earnings
1958	$98.43	38.1	$2.61	$95.70	33.0	$2.90	$97.57	33.3	$2.93	$100.62	42.1	$2.39
1959	105.83	39.6	2.70	109.03	35.4	3.08	111.34	35.8	3.11	103.52	42.6	2.43
1960	106.31	39.3	2.73	110.41	35.5	3.11	112.41	35.8	3.14	103.32	42.0	2.46
1961	107.66	39.4	2.75	110.62	35.8	3.09	112.01	35.9	3.12	105.75	41.8	2.53
1962	110.69	39.9	2.79	113.09	36.6	3.09	114.50	36.7	3.12	109.20	42.0	2.60
1963:												
January	114.11	40.7	2.81	120.43	39.1	3.08	120.90	39.0	3.10	110.09	41.7	2.64
February	114.70	40.6	2.83	121.29	39.0	3.11	122.77	39.1	3.14	110.51	41.7	2.65
March	111.91	39.9	2.82	113.77	36.7	3.10	114.56	36.6	3.13	110.77	41.8	2.65
April	113.84	40.5	2.82	117.73	38.1	3.09	119.81	38.4	3.12	111.45	41.9	2.66
May	114.89	41.0	2.81	122.14	39.4	3.10	124.66	39.7	3.14	110.62	41.9	2.64
June	118.94	41.8	2.85	128.74	41.0	3.14	130.60	41.2	3.17	113.36	42.3	2.68
July	110.94	[2]	[2]	108.19	[2]	[2]	110.21	[2]	[2]	112.36	42.4	2.65
August	115.07	40.9	2.82	118.18	38.0	3.11	119.32	38.0	3.14	113.52	42.6	2.66
September	117.22	41.1	2.86	123.48	39.2	3.15	124.97	39.3	3.18	113.67	42.1	2.70
October	116.24	41.2	2.83	121.68	39.0	3.12	123.48	39.2	3.15	113.05	42.5	2.66
November	114.88	40.6	2.84	117.94	37.8	3.12	119.45	37.8	3.16	113.10	42.2	2.68
December	118.20	41.3	2.87	125.85	39.7	3.17	128.40	40.0	3.21	113.79	42.3	2.69
1963 average	115.08	40.9	2.83	119.95	38.8	3.12	121.59	38.9	3.15	112.17	42.1	2.66

Year and month	Petroleum refining and related industries			Petroleum refining			Other petroleum and coal products		
	Weekly earnings	Weekly hours	Hourly earnings	Weekly earnings	Weekly hours	Hourly earnings	Weekly earnings	Weekly hours	Hourly earnings
1958	$111.66	40.9	$2.73	$115.02	40.5	$2.84	$94.60	43.0	$2.20
1959	117.42	41.2	2.85	121.99	40.8	2.99	97.61	43.0	2.27
1960	118.78	41.1	2.89	123.22	40.8	3.02	98.83	42.6	2.32
1961	124.31	41.3	3.01	129.24	40.9	3.16	102.10	42.9	2.38
1962	126.88	41.6	3.05	131.43	41.2	3.19	107.75	43.1	2.50
1963:									
January	130.62	41.6	3.14	137.52	41.8	3.29	102.25	40.9	2.50
February	126.36	40.5	3.12	132.68	40.7	3.26	97.96	39.5	2.48

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March	128.61	40.7	3.16	134.97	40.9	3.30	99.10	39.8	2.49
April	133.77	42.2	3.17	140.95	42.2	3.34	104.53	42.1	2.49
May	131.67	41.9	3.14	137.03	41.4	3.31	110.12	43.7	2.52
June	133.25	42.3	3.15	138.53	41.6	3.33	113.09	44.7	2.53
July	133.98	42.4	3.16	138.94	41.6	3.34	115.26	45.2	2.55
August	130.21	41.6	3.13	134.39	40.6	3.31	115.20	45.0	2.56
September	134.20	42.2	3.18	130.70	41.7	3.35	113.26	43.9	2.58
October	131.77	41.7	3.16	136.53	41.0	3.33	114.04	44.2	2.58
November	132.39	41.5	3.19	139.44	41.5	3.36	105.83	41.5	2.55
December	132.89	41.4	3.21	139.86	41.5	3.37	103.63	40.8	2.54
1963 average	131.64	41.6	3.16	137.55	41.4	3.32	107.88	42.6	2.53

[1] Weighted average using employment as weight computed by author.
[2] Data not available.

Source: Bureau of Labor Statistics. Employment and Earnings Statistics, Bull. 1312-1, 1963 and monthly reports September 1963 to March 1964.

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TABLE 24.—Labor turnover rates, mineral-fuel and related industries

(Per thousand employees)

Rates, year, and month	All manufacturing	Petroleum refining and related industries [1]	Petroleum refining	Coal mining
Total accession rate:				
1962 average	41	14	9	17
1963:				
January	36	13	9	22
February	33	9	6	22
March	35	16	10	25
April	39	21	11	22
May	40	20	10	21
June	48	30	24	15
July	43	19	11	21
August	48	13	8	29
September	48	14	10	23
October	39	12	9	18
November	29	9	8	17
December	25	7	6	14
Average, 1963	39	15	10	21
Total separation rate:				
1962 average	41	18	14	28
1963:				
January	40	18	15	21
February	32	19	13	20
March	35	18	12	25
April	36	16	12	28
May	36	17	13	22
June	34	18	13	18
July	41	17	11	26
August	47	21	14	18
September	49	31	26	19
October	41	18	13	14
November	38	18	10	15
December	37	23	11	20
Average, 1963	39	20	14	21
Layoff rate:				
1962 average	20	6	3	19
1963:				
January	22	8	4	14
February	16	9	3	13
March	17	7	2	16
April	16	5	3	18
May	15	5	3	14
June	14	3	1	10
July	20	4	2	16
August	19	6	2	7
September	18	8	6	8
October	19	8	5	5
November	21	10	3	7
December	23	15	3	14
Average, 1963	18	7	3	12

[1] Standard Industrial Classification Industry 295, paving and roofing materials included in total.

Source: Bureau of Labor Statistics. Employment and Earnings, Bull. 1312-1, 1963, and monthly issues September 1963 to March 1964.

PRICES AND COSTS

Value.—The index of average unit mine value for all segments of the mineral-fuel groups, shown in table 25, declined slightly, about 1 percent in 1963. The index attempts to show changes in the return to producers of crude minerals at the point of production. Value added in transportation and fabrication of the crude minerals are excluded. The index of implicit unit value, shown in table 26, is designed to represent the real price change of mineral commodities

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as implied by dividing the index of physical volume into an index of value. The index, which is a measure of relative rather than absolute prices, was completely revised in 1963 including data shown for earlier years.

Prices.—The wholesale price index for fuels and related products and power showed no major change for the sixth consecutive year. As shown in table 27, a slight 0.4-percent decline in the fuels group index resulted from small decreases in the crude petroleum and refined petroleum product indexes. Anthracite and gas fuels indexes actually increased, but their relatively smaller weight did not affect the movement of the total group index.

The comparative prices of individual fuels are shown in table 28. In general, there was overall price stability in 1963 although some individual price movements were mixed. Retail prices of bituminous coal increased while the cost of coal at merchant coke ovens declined. The prices of anthracite grades chestnut, pea, and buckwheat No. 1 were higher than 1962. Petroleum products showed slight price decreases across the board. The price of natural gas at the well remained fairly stable, with a 1.9-percent increase in 1963.

The cost of electricity by region and principal rate classes is shown in table 29. The national average of costs was virtually unchanged in 1962, including rates in the two classes. The U.S. residential rate per kilowatt-hour was 71 percent higher than the average of the combined commercial and industrial rate in 1963. The rate difference during the year was greater between regions than between classes of services. The industrial rate varies from a low of 0.7 cent per kilowatt-hour in the TVA area (East South Central) to 2.1 cents per kilowatt-hour in New England. The spread in the residential rate was not as large, with the highest rate in New England of 3.1 cents per kilowatt-hour, being slightly more than twice the lowest rate of 1.5 cents per kilowatt-hour in East South Central.

Costs.—The index of major input expenses, shown in table 30, covers bituminous coal and crude petroleum and natural gas. An anthracite series has been discontinued because productivity indexes for this fuel are no longer available. The index indicates only changes in operating costs. It does not reflect actual costs of producing these fuels because capital costs are omitted. In 1963 the bituminous coal index continued to decline while crude petroleum and natural gas held firm. The decline of the bituminous coal index has occurred during a period of increasing wages. However, the wage increase was more than offset by productivity advances, thus reducing unit labor costs. This situation does not prevail in petroleum and natural gas. Although wage rates have risen less than rates in bituminous coal, unit labor costs have increased because productivity advances have lagged behind wage increases.

Relative Labor Cost.—The indexes of relative labor costs shown in table 31 adjust average earnings by productivity to indicate movements in real labor costs per dollar of product obtained, value of product per man-period, and labor costs per unit of output. For bituminous coal, the index of labor costs per unit and the index of labor costs per dollar declined steadily from 1957 to 1963, while there was a general increase in the index of petroleum for the period.

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The index of value of product per man-period has shown steady gains over the same period for both items. The indexes further illustrate the productivity gains realized in the bituminous coal industry.

Machinery Prices.—Table 32 shows wholesale price indexes of selected machinery and equipment items important to the minerals industry. With the exception of oilfield machinery and tools, which declined slightly in 1963, all other items increased slightly or showed no change. The average increases in 1963 were slightly higher than the 1962 increases.

Fuel Costs, Electricity Generation.—The cost of fuel in steam-electrical power generation by region is shown in table 33. Regional costs of various fuels used to produce electric energy are in many cases quite competitive, particularly where fuel conversion facilities

TABLE 25.—Index of average unit mine value of minerals produced in the United States, by group and subgroup [1]

(1957-59=100)

Year	All minerals	Metals total	Nonmetals total	Fuels		
				Total	Coal	Crude oil and natural gas
1954	93	90	94	92	93	92
1955	94	101	95	92	92	92
1956	97	110	98	95	98	93
1957	102	101	99	102	103	102
1958	99	97	99	100	100	100
1959	98	102	101	98	97	98
1960	98	105	102	96	95	98
1961	98	103	102	97	93	99
1962	98	[2] 102	[2] 102	[2] 97	[2] 91	[2] 100
1963	98	106	102	96	90	99

[1] For description of index, see "Review of Minerals Industries" chapter in Minerals Yearbook, V. 1, 1959, pp. 22-24.
[2] Revised figure.

TABLE 26.—Index of implicit unit value of minerals produced in the United States, by group and selected subgroup [1]

(1957-59=100)

Year	All minerals	Fuels			Metals total	Nonmetals total
		Total	Coal	Crude oil and natural gas		
1947	67.3	67.8	84.3	62.4	63.5	74.7
1948	82.2	86.3	100.4	83.1	68.8	79.7
1949	81.4	84.2	98.7	80.5	69.6	82.4
1950	81.8	83.6	98.8	79.8	73.4	82.7
1951	85.2	85.4	101.4	81.3	85.1	87.2
1952	85.6	85.5	101.1	81.6	86.6	87.0
1953	90.5	90.2	101.2	87.5	91.2	92.5
1954	92.0	91.3	92.9	91.1	92.3	94.7
1955	94.5	92.5	99.3	91.1	103.9	96.4
1956	96.5	92.9	97.7	92.1	113.5	100.3
1957	100.9	101.2	103.3	101.1	102.5	98.6
1958	99.6	100.0	99.2	100.2	95.5	99.5
1959	99.5	98.6	96.8	98.7	101.5	101.9
1960	100.9	99.3	94.9	100.0	106.8	100.7
1961	101.1	100.5	93.0	101.3	102.8	100.4
1962	101.7	101.2	91.0	102.9	103.8	100.0
1963	101.7	100.9	91.0	102.9	107.2	100.1

[1] The entire index has been revised from 1947 to present.

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TABLE 27.—Average monthly wholesale price indexes for selected fuels

(1957–59=100 unless otherwise specified)

Year and month	Wholesale price index, all commodities	Fuels and related products, and power	Coal	Anthracite	Coke	Gas [1] fuels	Electric power [1]	Crude petroleum	Petroleum products, refined
1958	100.5	98.7	99.7	99.4	98.4	101.7	100.4	101.2	97.0
1959	100.6	98.7	99.4	101.0	103.2	110.9	100.8	97.8	96.5
1960	100.7	99.6	98.8	99.9	103.6	116.6	101.9	97.2	97.6
1961	100.3	100.7	97.7	95.7	103.6	118.6	102.4	97.5	99.3
1962	100.6	100.2	96.8	94.2	103.6	119.2	102.8	97.7	98.2
1963	100.3	99.8	96.9	96.0	103.6	122.8	102.0	97.3	97.2
January	100.5	100.4	98.3	98.7	103.6	120.8	102.5	97.7	98.2
February	100.2	100.3	98.4	98.7	103.6	127.8	102.5	97.3	97.1
March	99.9	100.8	98.1	98.9	103.6	127.8	102.4	97.3	98.2
April	99.7	100.3	95.0	89.9	103.6	124.1	102.4	97.3	98.2
May	100.0	100.4	94.2	89.9	103.6	120.1	102.2	97.3	99.1
June	100.3	100.9	94.9	91.5	103.6	120.3	102.2	97.3	99.9
July	100.6	100.4	95.8	92.5	103.6	121.2	102.0	97.3	98.7
August	100.4	98.9	96.2	93.9	103.6	120.9	101.9	97.3	96.1
September	100.3	99.0	97.2	97.3	103.6	121.7	101.8	97.3	95.9
October	100.5	98.8	97.7	97.3	103.6	122.0	101.4	97.2	95.6
November	100.7	97.9	98.3	101.6	103.6	122.3	101.3	97.2	93.8
December	100.3	99.3	98.3	101.6	103.6	124.8	101.3	97.2	96.1

[1] Gas and electricity beginning January 1958; January 1958=100.

Source: Bureau of Labor Statistics. Monthly Labor Review, V. 87, No. 3, March 1964, p. 372. 1962 Statistical Supplement, pp. 76–77.

TABLE 28.—Comparative fuel prices

Fuel	1962	1963
Bituminous coal:		
Average prices:		
Average retail price [1] dollars per net ton	17.30	17.46
Cost of coal at merchant coke ovens do	[3] 9.71	9.40
Anthracite, average sales realization per net ton at preparation plants, excluding dredge coal:		
Chestnut dollars	11.49	12.24
Pea do	9.63	10.15
Buckwheat No. 1 do	8.39	9.06
Petroleum and petroleum products:		
Crude petroleum, average price per barrel at well do	2.90	2.89
Gasoline, average dealers' net price (excluding taxes) of gasoline in 55 U.S. cities [2] cents per gallon	15.45	15.22
Residual fuel oil:		
No. 6 fuel, average of high and low prices in Philadelphia [2] dollars per barrel (refinery)	3.07	3.05
Bunker C, average price for all Gulf ports [2] do	2.15	2.12
Distillate fuel oil:		
No. 2 distillate, average of high and low prices at Philadelphia cents per gallon (refinery)	[3] 10.13	9.80
No. 2 distillate, average price for all Gulf ports [2] do	8.61	8.76
Natural gas:		
Average U.S. value at well cents per thousand cubic feet	15.5	15.8
Average U.S. value at point of consumption do	51.4	51.2

[1] Bureau of Labor Statistics published and unpublished data.
[2] Platt's Oil Price Handbook.
[3] Revised.

exist at powerplants. Here a slight shift in price can make a significant difference in the amount and type of fuel consumed. The differential in regional prices points to the significance of transportation costs, and the effect of long-term contracts in determining the final cost of the delivered mineral fuel. While 1963 data are not available, the 1962 data show stable prices for coal and oil, with a slight increase in the price of gas over the 1961 level.

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TABLE 29.—Cost of electrical energy per kilowatt-hour

(Cents)

Region	1957			1958			1959		
	Total	Residential [1]	Commercial and industrial	Total	Residential [1]	Commercial and industrial	Total	Residential [1]	Commercial and industrial
New England	2.6	3.3	2.2	2.6	3.3	2.2	2.6	3.2	2.1
Middle Atlantic	2.0	3.0	1.7	2.1	3.0	1.7	2.1	3.0	1.7
East North Central	1.7	2.7	1.4	1.7	2.6	1.4	1.7	2.6	1.4
West North Central	2.3	3.0	1.9	2.4	3.0	1.9	2.3	2.9	1.9
South Atlantic	1.8	2.5	1.5	1.8	2.5	1.5	1.8	2.4	1.5
East South Central	.8	1.7	.6	.8	1.6	.6	.8	1.6	.6
West South Central	1.8	2.9	1.4	1.8	2.8	1.4	1.8	2.8	1.4
Mountain	1.5	2.3	1.2	1.6	2.3	1.2	1.6	2.3	1.3
Pacific	1.3	1.8	1.0	1.4	1.9	1.1	1.4	1.8	1.1
Total United States	1.7	2.5	1.3	1.7	2.5	1.3	1.7	2.5	1.3
	1960			1961 [2]			1962 [2]		
New England	2.5	3.2	2.1	2.5	3.1	2.1	2.5	3.1	2.1
Middle Atlantic	2.0	2.9	1.7	2.0	[3] 2.9	1.7	2.0	2.9	1.6
East North Central	1.7	2.7	1.4	1.7	2.6	1.4	1.7	2.6	1.4
West North Central	2.2	2.8	1.8	2.2	2.8	1.5	2.2	2.7	1.8
South Atlantic	1.8	2.4	1.5	1.8	2.3	1.5	1.7	2.3	1.4
East South Central	.8	1.5	.7	.9	1.5	.7	.9	1.5	.7
West South Central	1.8	2.7	1.4	1.8	2.7	1.5	1.8	2.6	1.4
Mountain	1.5	2.3	1.2	1.5	2.4	1.2	1.5	2.3	1.2
Pacific	1.4	1.8	1.1	1.4	1.9	1.1	1.4	1.9	1.1
Total United States [4]	1.7	2.4	1.3	1.7	2.4	1.4	1.7	2.4	1.4

[1] Includes rural.
[2] Rural included in all 3 classes.
[3] Revised figure.
[4] Includes Alaska and Hawaii for 1960, 1961, and 1962.

Source: Edison Electric Institute, Statistical Year Book of the Electric Utility Industry, 1956 to 1961.

TABLE 30.—Index of major input expenses for bituminous coal and crude petroleum and natural gas mining [1]

(1957–59=100)

Year	Bituminous coal	Crude petroleum and natural gas	Year	Bituminous coal	Crude petroleum and natural gas
1954	94	88	1959	99	101
1955	95	87	1960	96	100
1956	99	91	1961	91	100
1957	103	96	1962	88	99
1958	98	103	1963	87	99

[1] Index constructed by author, using weights derived from the 1958 Census of Mineral Industries, and using data from U.S. Department of Labor, Bureau of Labor Statistics, wholesale price index, annual and monthly releases.

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TABLE 31.—Indexes of relative labor cost, mineral fuel mining

(1957–59=100)

Year	Index of labor costs per unit of output [1]		Index of value of product per man-period [2]		Index of labor costs per dollar of product [3]	
	Bituminous	Petroleum	Bituminous	Petroleum	Bituminous	Petroleum
1953	111	81	72	90	111	90
1954	96	86	77	90	103	92
1955	96	85	79	94	103	92
1956	100	89	89	96	101	96
1957	104	95	96	105	101	92
1958	98	105	99	95	99	104
1959	98	101	105	100	100	104
1960	94	100	108	103	98	103
1961	86	100	114	108	92	103
1962	82	98	118	[4] 114	89	102
1963	79	98	120	119	88	101

[1] Bituminous index based upon net tons per man per day (see "Coal" chapter, this volume) and index of average earnings derived from Bureau of Labor Statistics data on hourly earnings; petroleum index based on barrels per year (see "Petroleum" section, this volume) and Bureau of Employment Security data on total wages in petroleum production.

[2] Bituminous index based on net tons per man per day and mine values of production; petroleum index based on average employment and total value of production.

[3] Bituminous index based on index of value per man per day and index of average earnings; petroleum index based on total value of production and total wages.

[4] Revised figure.

TABLE 32.—Wholesale price indexes—selected machinery and equipment items

(1957–59=100)

Year	Oilfield machinery and tools	Mining machinery and equipment	Power cranes, draglines, shovels, etc.	Construction machinery and equipment	Specialized construction machinery
1954–58 (average)	93.0	86.8	90.2	89.6	90.9
1959	100.2	104.9	102.9	103.6	103.7
1960	100.3	106.4	105.1	105.8	106.9
1961	101.8	107.8	105.4	107.5	107.8
1962	103.2	108.4	106.1	107.8	107.4
1963	102.6	109.1	108.8	109.6	108.1
	Portable air compressors	Scrapers and graders	Contractor's air tools, handheld	Mixers, pavers, spreaders, etc.	Tractors other than farm
1954–58 (average)	88.7	90.2	85.8	90.5	88.6
1959	104.6	104.0	108.2	104.4	103.9
1960	105.4	104.7	108.2	108.7	106.4
1961	114.1	104.4	113.5	108.4	108.0
1962	113.7	105.3	113.5	110.3	108.5
1963	115.1	108.5	113.5	112.1	110.8

Source: Bureau of Labor Statistics, 1962 Statistical Supplement, Monthly Labor Review, p. 79.

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TABLE 33.—Cost of fuel in steam-electrical power generation[1]

(Cents per million Btu)

Region	Coal	Oil	Gas	Coal	Oil	Gas	Coal	Oil	Gas
	1957			1958			1959		
New England	41.0	46.9	40.7	40.1	40.7	37.8	37.7	35.8	34.5
Middle Atlantic	31.9	45.9	32.1	32.3	38.5	32.0	30.8	35.5	33.0
East North Central	25.8	68.2	23.1	25.8	68.5	24.6	25.6	73.2	[2] 24.5
West North Central	28.2	47.6	22.2	28.1	51.3	22.0	27.5	46.7	22.4
South Atlantic	29.0	46.2	25.8	28.6	39.7	27.6	27.2	35.5	29.7
East South Central	19.4	46.1	21.6	19.4	37.6	21.6	19.1	47.1	23.4
West South Central	14.9	41.7	12.9	15.6	41.8	12.9	15.8	43.2	15.0
Mountain	22.0	25.1	22.2	21.9	25.2	22.2	21.3	24.3	25.7
Pacific	-------	41.5	26.5	-------	42.0	26.5	-------	34.8	32.0
Average, United States	27.5	44.4	19.5	27.4	39.6	19.5	26.5	35.2	22.3
	1960			1961			1962		
New England	36.5	36.0	35.6	36.2	37.7	36.3	35.5	36.1	35.1
Middle Atlantic	30.0	35.1	35.7	29.9	36.2	37.7	29.0	34.2	37.2
East North Central	25.3	65.5	[2] 25.3	25.0	64.7	26.4	24.9	70.5	25.7
West North Central	27.0	43.4	23.0	26.2	47.4	22.8	26.6	49.7	23.8
South Atlantic	26.3	35.6	31.8	25.8	35.2	32.5	25.6	34.6	32.3
East South Central	19.6	50.3	24.8	19.7	50.9	25.4	19.3	48.9	25.4
West South Central	32.3	45.1	16.7	-------	43.8	19.0	-------	42.2	19.5
Mountain	20.2	25.0	27.8	19.6	25.6	28.5	22.7	25.1	29.0
Pacific	-------	32.3	33.4	-------	32.6	35.2	-------	33.6	34.8
Average, United States	26.0	34.5	23.8	25.8	35.5	25.1	25.6	34.5	26.4

[1] Steam-Electric Plant Factors 1956 through 1961, National Coal Association.
[2] Excludes blast-furnace gas, which would lower cost slightly.

Source: National Coal Association. Steam-Electric Plant Factors, 1957 through 1962.

INCOME AND INVESTMENT

National Income Originated.—National income for selected industries, as shown in table 34, includes wages and salaries paid and profits generated in these industries. The tendency of national income generated in mineral fuels mining to grow at a slower rate than the rest of the economy continued in 1963, although increases of 6.3 percent for anthracite and 2.3 percent for bituminous coal reversed a long downward trend. The slight decline of 1.7 percent in crude petroleum and natural gas offset the moderate gains of anthracite and bituminous mining, resulting in almost no change for total mineral fuel mining in 1963. Manufacturing of products of petroleum, however, moved from a 1.9 percent increase in 1962 to a substantial 14.8 percent increase in 1963, while the average income in all industries increased 5.0 percent during the year.

Investment.—Current data on total fuel investments are not available. Book values of domestic investments contained in the statistical summary of balance-sheet data from corporate income tax returns are available after a 2-year delay. An indication of current rates of investment in the mineral-fuel industries, both domestic and foreign, are given in tables 35, 36, 37, and 38. Mining expenditures on new plant and equipment decreased 3.7 percent in 1963, while in the manufacturing sector investment in petroleum and coal products increased by 1.4 percent. Combined expenditures for new plant and equipment as well as for the purchase of

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new corporate securities were considerably higher for the manufacturing sector than for the mining sector of mineral industry in 1963. The book value of direct private investment of U.S. companies in foreign petroleum increased from $12.7 million at the end of 1962 to $13.7 million in 1963. Most of the 8-percent increase resulted from accelerated rates of investment in Canada and Europe. Canada showed an increase of 10 percent while increases in Europe were close to 20 percent. The added investment in Europe was related especially to the expansion of petroleum refinery capacity in Germany and Italy. Petroleum investments alone accounted for 34 percent of the $40,645 million invested abroad in 1963. Total value of direct investments in U.S. companies by foreigners rose above $7.9 billion in 1963. Investments in petroleum in 1962 were $1,419 million and $1,513 million in 1963. The primary source of this $94 million increase was a result of undistributed profits of U.S. subsidiaries and from the rising market values of securities held.

TABLE 34.—National income by industrial origin in selected industries

Industry	1962 [1] (millions)	Change from 1961 (percent)	1963 (millions)	Change from 1962 (percent)
All industries	455,618	+6.7	478,493	+5.0
Mining	5,440	−1.6	5,414	−.5
Metal mining	802	−10.2	779	−2.9
Anthracite mining	79	−6.0	84	+6.3
Bituminous and other soft coal mining	1,013	−3.2	1,036	+2.3
Crude petroleum and natural gas	2,692	−3.2	2,647	−1.7
Nonmetallic mining and quarrying	854	+5.3	868	+1.6
Manufacturing	130,845	+9.1	137,369	+5.0
Products of petroleum and coal	3,996	+1.9	4,587	+14.8

[1] Revised figures.

Source: U.S. Department of Commerce, Office of Business Economics, Survey of Current Business, July 1964, table 7.

TABLE 35.—Expenditures on new plant and equipment by firms in mining and selected mineral manufacturing industries

(Billion dollars)

	1961	1962	1963
Mining [1]	0.98	1.08	1.04
Manufacturing:			
Primary iron and steel	1.13	1.10	1.24
Primary nonferrous metals	.26	.31	.41
Stone, clay, and glass products	.51	.58	.61
Chemical and allied products	1.62	1.56	1.61
Petroleum and coal products	2.76	2.88	2.92
Total manufacturing	13.68	14.68	15.69

[1] Including fuels.

Source: U.S. Department of Commerce, Office of Business Economics, Survey of Current Business, March 1963, p. 7; March 1964, p. 13.

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TABLE 36.—Direct private investment of U.S. companies in foreign petroleum industries, 1963

(Million dollars; net inflows to the United States(−))

Country	Petroleum				All industries			
	Book value beginning of year	Net capital movements	Undistributed earnings of subsidiaries	Book value end of year	Book value beginning of year	Net capital movements	Undistributed earnings of subsidiaries	Book value end of year
Canada	2,834	186	69	3,133	12,133	339	528	13,016
Latin American Republics:								
Mexico, Central America, and West Indies	245	22	1	284	1,912	85	79	2,064
Mexico	67	−5	−3	66	867	25	13	907
South America:								
Brazil	79	−16	−4	60	1,084	−12	57	1,128
Colombia	257	−14	2	246	455	−1	8	465
Venezuela	2,202	−41	10	2,166	2,816	−36	32	2,807
Total	3,159	−81	13	3,094	8,424	64	173	8,657
Dependencies in Western Hemisphere	485	77	−24	533	1,050	156	10	1,218
Europe	2,365	356	86	2,828	8,930	893	568	10,351
Africa	627	62	5	701	1,271	104	46	1,423
Middle East	1,148	58	9	1,201	1,200	62	11	1,274
Far East	612	95	8	718	1,300	143	64	1,510
Oceania	462	24	8	496	1,271	100	83	1,463
International enterprises	968	33	7	988	1,647	27	82	1,732
Grand total	12,661	810	182	13,698	37,226	1,888	1,565	40,645

Source: Office of Business Economics, U.S. Department of Commerce, Survey of Current Business, August 1964.

TABLE 37.—Value of foreign direct investments in the United States

(Millions of dollars)

Industry	1958	1959	1960	1961	1962	1963
Total	6,115	6,604	6,910	7,392	7,612	7,944
Petroleum	1,099	1,184	1,288	1,325	1,419	1,513

Source: Office of Business Economics, U.S. Department of Commerce, Survey of Current Business, August 1964.

TABLE 38.—Estimated gross proceeds of new corporate securities offered for cash in the United States in 1963 [1]

Type of security	Total corporate		Manufacturing		Mining [2]	
	Value (millions)	Percent	Value (millions)	Percent	Value (millions)	Percent
Bonds	10,872	89	3,225	91	145	68
Preferred stock	342	3	47	1	[3]	
Common stock	1,022	8	271	8	69	32
Total	12,236	100	3,543	100	214	100

[1] Substantially all new issues of securities offered for cash sale in the United States in amounts over $100,000 and with terms to maturity of more than 1 year are covered in these data.
[2] Including fuels.
[3] Less than $½ million.

Source: U.S. Securities and Exchange Commission, Statistical Bulletin, V. 23, No. 6, June 1964, p. 11.

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RESEARCH AND DEVELOPMENT

Research and development are significant factors in economic growth and national security. New and improved products and processes result from technological advances that in turn are based on the accumulation and application of scientific and engineering knowledge. Money spent on research and development is frequently a minor part of total expenditures of an industry. Nevertheless such expenditures are significant in terms of future growth and development of the industry. The National Science Foundation collects information on research and development expenditures, and on the types of personnel employed in these activities.

Expenditures for research and development activities in selected industries are shown in table 39. About one-tenth of the funds expended in 1961 were in the chemicals and allied products sector which includes the rapidly expanding petrochemicals industry. Petroleum refining and extraction expenditures for research and development were also significant in 1961, being about 3 percent of the total. Expenditures in the petroleum sector are largely financed at the company level, with less than 1 percent of the total in 1961 coming from Federal funds. A higher proportion of the funds expended in petroleum refining and petroleum and natural gas extraction are devoted to basic and applied research than is the case for the average of all industries where the major emphasis is on development. Table 40 shows that the mineral-fuel industries also have a high proportion of scientists and engineers relative to the number of technicians employed. The ratio of technicians to scientists and engineers employed is most favorable in petroleum refining and processing, followed by the petroleum natural gas and coal producing industries.

TABLE 39.—Research and development activity

	Funds expended (million dollars)						Percentage distribution of funds		
	Total		Company [1]		Federal		1961		
	1960	1961	1960	1961	1960	1961	Basic	Applied	Development
Petroleum refining and extraction	290	294	284	286	16	19	16	42	42
Percent of all industries	2.8	2.7	6.4	6.3	0.3	0.3			
Chemicals and allied products	986	1,073	833	877	182	224	11	37	52
Percent of all industries	9.4	9.9	18.8	19.2	3.0	3.5			
All industries	10,507	10,872	4,425	4,559	6,082	6,313	4	18	78

[1] Other sources $68 million in 1960, and $79 million in 1961 included with company data.

Source: National Science Foundation, Research and Development in Industry, 1961, NSF 64-9.

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TABLE 40.—Scientists and engineers, technicians, and ratio of technicians to scientists and engineers, in selected industries, January 1962

	Number engaged in all areas			Number primarily engaged in research and development		
	Scientists and engineers	Technicians	Average number of technicians per 100 scientists and engineers	Scientists and engineers	Technicians	R&D technicians per 100 R&D scientists and engineers
All industries	851,600	585,100	68.7	303,800	151,000	49.7
Chemicals and allied products	95,500	43,400	45.5	39,700	17,500	44.2
Petroleum refining	20,900	9,400	44.7	3,900	2,400	61.0
Crude petroleum and natural gas	16,400	7,100	43.4	1,400	200	13.0
Coal mining	3,100	1,200	39.4	200	200	103.2

Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment of Scientific and Technical Personnel in Industry in 1962.

GOVERNMENT ACTIVITIES

In addition to preparing and issuing a number of periodical reports and publications on mineral fuels during 1963, the Bureau of Mines carried out established programs relating to the conservation and development of mineral fuels and related resources and products. In the bituminous coal and anthracite sectors, technical-economic research was carried out on mining methods and practices, with the objectives of achieving increased operational efficiency, greater recovery of coal in place, and safer working conditions for the miners. Reports were prepared during the year on the production and utilization of bituminous coal, anthracite, and related products. In the petroleum, natural gas, and oil shale sectors of Bureau activity, technical-economic research was carried out relating to exploration and development, production by primary methods, and refining and processing. Studies were carried out on the characteristics of reservoir oils in selected areas, on the oil and gas resources of selected States and on the characteristics of crude oils based on samples from oilfields. The Bureau's program of resource investigations also provided technical and economic information on mineral fuel resources designed to assist in the orderly development and the maintenance of adequate supplies of these resources, as well as providing guidance in planning national and technical-economic research programs.

WORLD REVIEW

U.S. Trade.—There were no significant shifts in U.S. foreign trade in mineral fuels in 1963. Exports of bituminous coal again increased during the year, while net imports of crude petroleum and refined petroleum products were stablized under the oil imports control program. Value of mineral fuel exports by region and type is shown in tables 41 and 42. In 1963 bituminous coal exports reached the highest level since 1957. The destination of coal exports is mainly to Western Europe despite the continuation of import restrictions imposed by several countries there. Coal and coke exports to Canada and Japan also remained high in 1963. Although controls are im-

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posed on imports of crude petroleum and refined products into the United States, the country remains one of the world's largest importers of petroleum. Value of crude petroleum imports in 1963 was slightly above the 1962 level, while the value of refined product imports was up 8 percent. About three-quarters of the refined products imported was residual fuel oil, the bulk of which came from Caribbean sources, mainly Venezuela. Venezuela was also the largest source of imported crude petroleum in 1963, accounting for 42 percent of total shipments into the United States. Canada accounted for about one-quarter of crude imported, while the Middle East countries—including Saudi Arabia, Kuwait, Iran, and the Neutral Zone—accounted for another quarter of the total. Asia, principally Sumatra, contributed about 5 percent in 1963, while new producing areas in North Africa, mainly Libya, accounted for about 1 percent of U.S. crude imports. While U.S. natural gas exports have not been significant, imports are steadily increasing. Originating mainly in Canada, overland imports of gas remain a very small portion of the total U.S. consumption.

On the import side in 1963, crude petroleum and refined products exclusive of chemicals accounted for about 90 percent of the total value of mineral fuel imports. On the export side, the value of expanding shipments of coal and coke continued to rise. While small in quantity, shipments of high value specialty petroleum products cause petroleum to be first in value of mineral fuels exported. Exports of chemical materials including petrochemicals are also increasing at a rapid rate.

World Production.—In addition to being a major importer, the United States is also the world's largest producer of crude petroleum. As shown in table 43, the United States accounted for 30 percent of the total world crude petroleum output in 1963 and consumed about 35 percent of the world supply. While data are not available on world marketed production and consumption of natural gas, the United States is by far the world's largest commercial producer and consumer. The United States also produces and consumes about 15 percent of the world production of bituminous coal. In anthracite, the United States produced 9 percent of world output in 1963 and accounted for 7 percent of world demand. Trends of mineral fuel production in the major regions of the world are shown in table 44. Since 1959 the world level of coal output has been increasing at a minimum rate, with most of the small increase in the United States and Asia. With the increasing dependence of Western Europe on outside sources of petroleum to meet that continent's energy requirements, Europe's production of coal has declined. In contrast, the world production of petroleum and natural gas in 1963 was 46 percent higher than in 1958. Much of the increase in output of petroleum and gas has been outside the United States, mainly in the Middle East producing countries (included under Asia in table 44) and Caribbean area in Latin America. The production index also shows a large rise in petroleum and gas production in Europe and in coal in Asia. However, these increases are from a relatively low

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base. Nevertheless in consumption of energy fuels and electric power, Western Europe had one of the world's highest growth rates in 1963. Table 45 shows the average production of electricity and

TABLE 41.—Regional distribution of U.S. imports and exports of selected mineral fuels and related products, 1963

(Thousand dollars)

SITC No.	Group	North America	South America	Europe	Asia	Australia and Oceania	Africa
321	Coal, coke, etc.:						
	Imports	5,551	----------	748	1	----------	----------
	Exports	136,867	19,178	264,463	61,060	76	414
331	Petroleum, crude, etc.:						
	Imports	270,652	534,087	1,487	240,319	----------	18,562
	Exports	20	----------	1,662	2,934	----------	----------
332	Petroleum products:						
	Imports	368,719	320,818	5,095	12,367	----------	534
	Exports	65,544	38,284	148,507	138,750	20,238	29,684
341	Gas, natural, manufactured:						
	Imports	17,105	25	530	61	112	20
	Exports	102,568	589	498	97	1	----------
	Total selected mineral fuels:						
	Imports	747,490	855,494	7,828	252,784	1	19,096
	Exports	304,999	58,051	415,130	202,841	20,315	30,098
521	Mineral tar and crude chemicals from coal, petroleum, natural gas: [1]						
	Imports	16,598	8,590	9,367	412	8	----------
	Exports	8,158	2,431	29,956	11,303	988	1,079
	Grand total:						
	Imports	764,088	864,084	17,195	253,196	9	19,066
	Exports	313,157	60,482	445,086	214,144	21,303	31,177

[1] Excludes $11.5 million of exports, shown in the "Security Restricted" category for which country of destination is not shown.

Source: U.S. Department of Commerce, Bureau of the Census, Annual 1963 FT 120 and FT 420.

TABLE 42.—Value of imports and exports, mineral fuels and products [1]

(Thousand dollars)

SITC No.	Group	Imports for consumption			Exports of domestic merchandise		
		1961	1962	1963	1961	1962	1963
321	Coal, coke, etc.	3,283	4,187	6,301	348,104	388,710	482,058
331	Petroleum, crude, etc.	998,288	1,071,650	1,065,107	8,541	5,110	4,616
332	Petroleum products	633,279	656,342	707,535	389,190	411,434	441,008
341	Gas, natural and manufactured	50,022	91,901	103,753	17,213	15,402	17,853
	Total: mineral fuels, lubricants, and related products	1,684,872	1,824,080	1,882,696	763,048	820,656	945,535
521	Tar, crude petroleum chemicals	29,505	46,757	34,977	69,641	67,501	65,438
	Grand total	1,714,377	1,870,837	1,917,673	832,689	888,157	1,010,973

[1] Grouping of commodities based upon Standard International Trade Classification of United Nations. Basic data for 1961 compiled by Division of Economic Analysis, Bureau of Mines, from U.S. Commerce reports FT-110 and FT-410. 1962 and 1963 data taken directly from FT-120 and FT-420.

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mineral fuels in selected OECD countries between 1954 and 1963, compared with production in the United States.

World Trade Prices.—Mineral fuels and products prices in world trade are shown in table 46. Changes in 1963 were slight with little fluctuation in crude petroleum and refined products prices. There was some upward price change in coal prices in Europe, while the coal price index declined for the United States.

TABLE 43.—World production; U.S. production and consumption, selected mineral fuels

	World production	1962 [1]			
		U.S. production		U.S. apparent consumption	
		Amount	Percent of world production	Amount	Percent of world production
Crude petroleum.....thousand barrels	8,882,218	2,676,189	30	3,069,631	35
Natural gas.....million cubic feet	(2)	13,876,622	(2)	13,890,129	(2)
Bituminous and lignite thousand short tons	2,611,415	422,149	16	387,774	15
Anthracite.....do	198,100	16,894	9	14,300	7
	1963				
Crude petroleum.....thousand barrels	9,535,434	2,752,724	29	3,170,652	33
Natural gas.....million cubic feet	(2)	14,746,633	(2)	14,640,480	(2)
Bituminous and lignite thousand short tons	2,724,032	458,928	17	409,225	15
Anthracite.....do	202,000	18,267	9	14,200	7

[1] Revised figures.
[2] Data not available.

TABLE 44.—Index of world production: Coal, crude petroleum, and natural gas

(1958=100)

Year	Coal					Crude petroleum and natural gas				
	Free world	North America [1]	Europe [2]	Latin America [3]	Asia [4]	Free world	North America [1]	Europe [2]	Latin America [3]	Asia [4]
1959	97	100	96	100	100	107	105	[5] 119	108	112
1960	97	100	94	96	110	118	106	[5] 144	112	123
1961	96	96	92	[5] 107	117	128	108	[5] 166	115	133
1962	98	[5] 101	93	[5] 107	122	[5] 139	112	[5] 181	126	[6] 147
1963 [6]	100	109	94	104	125	146	114	192	129	154

[1] Canada and United States.
[2] Excluding Albania, Bulgaria, Czechoslovakia, Eastern Germany, Hungary, Poland, Rumania, and the U.S.S.R.
[3] Central and South America, and the Caribbean Islands.
[4] Afghanistan, Brunei, Burma, Ceylon, Taiwan, Hong Kong, India, Indonesia, Iran, Japan, Republic of Korea, Malaysia (excluding Sabah), Pakistan, Philippines, Thailand, and the Republic of Vietnam.
[5] Revised figure.
[6] Preliminary figure.

Source: U.N. Monthly Bulletin of Statistics, May 1964, Special Table A.

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TABLE 45.—Monthly average of production of electricity and mineral fuels in selected OECD countries

Product	United States	European members OECD	United Kingdom	Germany, West	France	Italy	Spain	Netherlands	Belgium	Austria
Electric power (billion kw.-hr.)										
1954	45.4	27.4	6.1	[1] 5.8	3.6	3.0	0.9	0.8	0.9	0.6
1955	51.9	29.8	6.7	[1] 6.5	3.9	3.2	1.0	.9	.9	.7
1956	56.9	32.5	7.3	[1] 7.3	4.2	3.4	1.2	1.0	1.0	.8
1957	59.6	34.4	7.6	7.8	4.5	3.6	1.2	1.1	1.1	.8
1958	60.3	36.7	8.2	8.1	4.9	3.8	1.3	1.1	1.0	.9
1959	66.2	39.0	8.8	8.7	5.2	4.0	1.4	1.2	1.1	1.0
1960	70.0	43.5	9.9	9.6	5.9	4.5	1.5	1.3	1.2	1.1
1961	73.1	46.6	10.6	10.2	6.1	4.9	1.7	1.4	1.2	1.1
1962	78.6	50.7	11.8	11.1	6.7	5.2	1.8	1.5	1.4	1.2
1963	84.0	54.7	12.8	12.1	7.1	5.7	2.0	1.7	1.5	1.3
Hard coal (million metric tons)										
1954	31.69	40.60	18.97	12.07	4.53	.09	1.03	1.01	2.44	-------
1955	37.40	40.70	18.76	12.33	[1] 4.61	.10	1.03	.99	2.50	-------
1956	39.89	41.10	18.80	12.62	4.59	.09	1.07	.99	2.46	-------
1957	38.94	41.20	18.93	12.47	4.73	.09	1.16	.95	2.42	-------
1958	31.75	40.50	[1] 19.28	[1] 12.48	4.81	.06	1.20	.99	2.26	-------
1959	32.19	38.60	[1] 17.47	[1] 11.88	4.80	.06	1.14	1.00	1.90	-------
1960	32.39	37.50	16.46	[1] 11.94	4.66	.06	1.15	1.04	1.87	-------
1961	31.21	36.90	16.13	[1] 11.97	4.36	.06	1.15	1.05	1.79	-------
1962	33.03	37.10	16.80	11.76	4.36	.06	1.04	.96	1.77	-------
1963	35.58	36.70	16.60	11.84	3.98	.05	1.08	.96	1.78	-------
Crude petroleum (million metric tons)										
1954	26.09	.63	-------	.22	.04	.01	------	.08	-------	.28
1955	27.98	.76	-------	.26	.07	.02	------	.09	-------	.31
1956	29.48	.85	-------	.29	.11	.05	------	.09	-------	.29
1957	29.49	.97	-------	.33	.12	.11	------	.13	-------	.27
1958	27.57	1.01	-------	.37	.12	.13	------	.14	-------	.24
1959	28.99	1.09	-------	.43	.14	.14	------	.15	-------	.21
1960	29.00	1.19	-------	.46	[1] .17	.17	------	.16	-------	.20
1961	[1] 29.53	1.26	-------	.52	.18	[1] .17	------	.17	-------	.20
1962	30.14	1.33	-------	.57	.20	.15	------	.18	-------	.20
1963	31.00	1.44	-------	.62	.21	.15	------	.19	-------	.22
Natural gas (billion cubic meters)										
1954	20.63	.33	-------	.01	.02	.25	------	-------	-------	[1] .05
1955	22.19	.41	-------	.02	.02	.30	------	-------	-------	.06
1956	23.79	.49	-------	.03	.03	.37	------	-------	-------	.06
1957	25.20	.56	-------	.03	.05	.42	------	-------	-------	.06
1958	26.03	.62	-------	.03	.09	.43	------	-------	-------	.07
1959	27.08	.85	-------	.03	.22	.51	------	-------	-------	.09
1960	30.03	1.07	-------	.04	.37	.54	------	-------	-------	.12
1961	30.91	1.24	-------	.04	.50	.57	------	-------	-------	.13
1962	32.04	1.37	-------	.05	.58	.60	------	-------	-------	.14
1963	[2]	1.45	-------	.08	.63	.61	------	-------	-------	.14
Coking coal (million metric tons)										
1954	4.5	6.65	1.52	3.23	.79	.22	.10	.28	.51	.14
1955	5.7	7.42	1.53	3.72	.92	.25	.12	.33	.55	.15
1956	5.6	[1] 8.06	1.66	3.98	1.04	.28	.13	.35	.61	.17
1957	5.7	[1] 8.36	1.73	4.15	1.07	.31	.16	.35	.60	.18
1958	4.0	7.98	1.56	3.99	1.06	.28	.17	.34	.58	[2]
1959	4.1	7.54	1.44	3.57	1.12	.27	.20	.34	.60	[2]
1960	4.3	7.99	1.60	3.73	1.14	.31	.21	.38	.63	[2]
1961	3.9	7.85	1.51	3.71	[1] 1.11	[1] .33	.22	.38	.60	[2]
1962	3.9	7.56	1.32	3.60	1.09	.36	.23	[1] .36	.60	[2]
1963	4.1	7.48	1.32	3.49	1.09	.38	[2]	.36	.60	[2]
Lignite (million metric tons)										
1954	-------	8.37	-------	7.32	.16	.05	.15	-------	-------	.52
1955	-------	8.64	-------	7.53	.17	.04	.15	-------	-------	.55
1956	-------	9.09	-------	7.94	.19	.03	.16	-------	-------	.56
1957	-------	9.33	-------	8.07	.19	.03	.21	-------	-------	.57
1958	-------	9.09	-------	[1] 7.81	.19	.07	.22	-------	-------	.54
1959	-------	9.07	-------	[1] 7.80	.18	.10	.18	-------	-------	.52
1960	-------	9.24	-------	[1] 8.01	.19	.06	.15	-------	-------	.50
1961	-------	9.45	-------	8.10	.24	.13	.17	-------	-------	.47
1962	-------	9.92	-------	[1] 8.44	.24	.15	.21	-------	-------	.47
1963	-------	10.39	-------	8.89	.21	.12	.21	-------	-------	.50

[1] Revised figure.
[2] Not available.

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TABLE 46.—World-trade price indexes

(1957–59=100)

Mineral	1957	1958	1959	1960	1961	1962	1963
Crude petroleum:							
Kuwait	101.2	104.0	94.9	92.2	89.4	89.4	89.4
Saudi Arabia	101.7	103.1	95.2	92.3	89.2	89.2	89.2
United Kingdom	112.8	98.2	89.1	84.4	[1] 80.2	[1] 79.2	78.3
United States:							
West-Texas Sour	101.4	101.4	97.2	96.9	101.6	101.1	101.1
Refugio-Light	104.0	99.6	96.6	96.6	96.6	96.6	96.6
Saudi Arabian	109.9	99.3	90.7	85.4	[1] 81.3	[1] 80.1	79.0
Venezuelan	103.8	102.0	94.3	92.2	91.3	[1] 91.0	90.7
Venezuela:							
Export price f.o.b. Puerta La Cruz	102.1	102.5	95.5	94.1	94.1	94.1	94.1
Export price f.o.b. Amuay	102.5	102.9	94.5	92.8	92.8	92.8	92.8
Petroleum products:							
United Kingdom	110.7	94.0	95.4	98.3	110.5	115.4	115.0
U.S. distillate No. 2	107.4	95.1	97.4	91.7	98.5	95.1	95.1
U.S. gasoline	105.2	97.5	97.5	99.4	109.0	106.2	103.3
Coal:							
Canada	99.0	100.5	100.5	100.5	99.0	99.7	106.5
Germany	96.8	101.6	101.6	104.9	104.9	106.2	108.2
United Kingdom	122.3	98.4	79.4	72.2	71.4	n.a.	n.a.
United States	103.0	100.1	96.8	95.6	93.6	91.7	88.1

[1] Revised figure.

Source: United Nations Monthly Bulletin of Statistics, August 1963, table 51.

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Employment and Injuries in the Fuel Industries

By Forrest T. Moyer [1]

Contents

	Page		Page
Introduction	43	Peat	46
Coal	43	Native asphalt	47
Coke	45	Conclusion	48
Oil and gas	46		

INTRODUCTION

THIS CHAPTER of the Minerals Yearbook contains injury experience and related employment information for the coal-mining, coking, oil and gas, peat, and native asphalt industries in the United States for 1963. No attempt has been made to combine these data and present injury-frequency rates reflecting the mineral-fuel industries because the hazards of the separate industries are not comparable. Tabulations showing the trend of injuries and employment for all mineral industries are presented in Volume III of the Minerals Yearbook.

COAL

Injury experience of the coal-mining industry was improved slightly in 1963, as measured by the 2-percent decline in the injury-frequency rate. Although the total number of fatal and nonfatal injuries increased 1 percent, the greater proportional increase of 3 percent in man-hours worked accounted for the improved frequency rate. Employment and injury data for 1963 are based on final data for anthracite mines and preliminary data for bituminous coal and lignite mines.

A drop of five in the number of deaths reported made 1963 the third consecutive year to show a decrease in fatalities. Two major disasters (a single accident resulting in the death of five men or more) occurred in 1963. Both disasters were caused by gas explosions; one killed 22 men in a West Virginia mine on April 25 and the other took 9 lives in a Utah mine on December 16. The number of nonfatal injuries was 146 above the 1962 total. Continuing the long-term downward trend in employment, the average number of men em-

[1] Chief, Branch of Accident Analysis.

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ployed declined 2 percent in 1963. However, these men worked 11 more days and averaged 7.85 hours a day.

Bituminous Coal Mines.—Preliminary data for bituminous coal and lignite mines in 1963 indicated that the number of injuries (fatal and nonfatal) was virtually unchanged from 1962. However, an accompanying 3-percent increase in man-hours resulted in an improved frequency rate of occurrence per million man-hours, 3 percent lower than in 1962.

The 1963 fatality rate of 1.07 was 7 percent lower than the 1962 rate of 1.15 and the nonfatal rate of 41.60 was 3 percent under the 1962 rate of 42.86. Fatal injuries decreased 4 percent in 1963. Of the 252 fatalities reported, 218 occurred underground, 12 at surface operations, 19 at strip mines, and 3 at auger mines. Four leading causes accounted for 90 percent (227) of the overall death total. Falls of roof, face, or rib killed 123 men (49 percent); haulage accidents took 44 lives (17 percent); explosions caused the death of 31 men (12 percent); and machinery accounted for 29 fatalities (12 percent). The remaining fatalities resulted from a variety of causes such as electricity, explosives, and mine fires. The Bureau of Mines estimated that 9,795 nonfatal lost-time injuries occurred in 1963, 12 more than in 1962. The average number of men working decreased 2 percent in 1963; days active increased by 11 to a total of 207 days.

Anthracite Mines.—The injury-frequency rate (fatal and nonfatal) increased 10 percent in 1963 at Pennsylvania anthracite mines. Fatalities occurred at a frequency rate of 1.52 per million man-hours of exposure, an increase of 21 percent over the 1962 rate of 1.26. Nonfatal injuries occurred at a rate of 61.53, an increase of 10 percent, compared with the 1962 rate of 57.40.

TABLE 1.—Employment and injury experience at coal mines in the United States, 1959–63 [1]

Industry and year	Average men working daily [2]	Average active mine days [3]	Man-days worked (thousand)	Man-hours worked (thousand)	Number of injuries		Injury rate per million man-hours
					Fatal	Nonfatal	
Bituminous coal mines: [4]							
1959	180,303	187	33,738	266,660	246	10,440	40.07
1960	170,628	190	32,417	257,075	290	10,501	41.98
1961	151,776	194	29,453	232,871	275	9,902	43.70
1962	147,276	196	28,863	228,267	263	9,783	44.01
1963 [5]	143,800	207	29,763	235,470	252	9,795	42.67
Anthracite mines:							
1959	23,294	173	4,036	29,371	47	1,723	60.26
1960	19,051	176	3,360	24,452	35	1,401	58.73
1961	15,792	196	3,098	22,424	19	1,295	58.60
1962	14,010	204	2,853	20,680	26	1,161	57.40
1963	13,498	216	2,912	21,048	32	1,295	63.05
Total coal mines:							
1959	203,597	186	37,773	296,031	293	12,163	42.08
1960	189,679	189	35,778	281,528	325	11,902	43.43
1961	167,568	194	32,551	255,296	294	11,197	45.01
1962	161,286	197	31,716	248,946	289	10,944	45.12
1963 [5]	157,298	208	32,675	256,518	284	11,090	44.34

[1] Man-days and man-hours of employment have been rounded to the nearest thousand and will not necessarily add to the published total.
[2] Average number of men at work each day mine was active. Because absenteeism and labor turnover were considered, this number is lower than number of men available for work, as measured by a count of names on payroll.
[3] Average in which operating time of each mine is weighted by average number of workers in mines.
[4] Includes lignite.
[5] Bituminous data for 1963 are preliminary.

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Of the 32 deaths reported, 27 were at underground mines, 3 at stripping operations, 1 at a culm bank mine, and 1 at a preparation plant. Dredge operations had no fatalities. Falls of roof, face, or rib killed 13 men, 5 more than in 1962. Explosions claimed five lives; haulage, four; explosives, three; machinery, two; and all other causes, five. Nonfatal injuries totaled 1,295 in 1963, and records show that 845 occurred underground, 178 at strip mines, 174 at preparation plants, 30 at culm banks, 3 at dredges, and 65 at surface operations.

Employment continued to decline, decreasing 4 percent. Employees worked 2 percent more man-hours in 1963 and averaged 1,559 hours each, 83 more than last year. The average workday was 7.23 hours in 1963, essentially the same as in 1962. Anthracite mines were active an average of 216 days during the year, 12 more than in 1962.

COKE

The overall injury-frequency rate of the coking industry in 1963 was 15 percent better than in 1962. Fatalities decreased 36 percent and nonfatal disabilities 15 percent; the corresponding rates of occurrence dropped 34 and 14 percent, respectively. Total man-hours of work decreased 2 percent in 1963, and the medial operating time was 7 days fewer. Employees averaged 2,818 hours during the year and worked an 8-hour shift.

Slot Ovens.—Injuries (fatal and nonfatal) at slot ovens in 1963 dropped 20 percent in number and 18 percent in frequency of occurrence per million man-hours of exposure. Employment remained comparatively stable in 1963, but employees worked 2 percent fewer man-hours and 7 fewer days than in 1962. Slot-oven workers worked

TABLE 2.—Employment and injury experience at coke ovens in the United States, 1959–63 [1]

Industry and year	Average men working daily [2]	Average active plant days [3]	Man-days worked (thousand) [4]	Man-hours worked (thousand) [4]	Number of injuries		Injury rate per million man-hours
					Fatal	Nonfatal	
Slot ovens:							
1959	15,865	337	5,354	42,782	3	183	4.35
1960	15,779	360	5,673	45,353	3	177	3.97
1961	13,106	359	4,707	37,661	3	167	4.51
1962	12,723	363	4,623	36,969	9	237	6.65
1963	12,696	356	4,524	36,192	7	190	5.44
Beehive ovens:							
1959	780	145	113	844	----------	39	46.20
1960	684	139	95	712	----------	46	64.57
1961	428	196	84	645	----------	26	40.33
1962	357	191	68	533	2	15	31.89
1963	347	209	73	567	----------	23	40.57
All ovens:							
1959	16,645	328	5,467	43,626	3	222	5.16
1960	16,463	350	5,768	46,066	3	223	4.91
1961	13,534	354	4,791	38,306	3	193	5.12
1962	13,080	359	4,691	37,502	11	252	7.01
1963	13,043	352	4,596	36,759	7	213	5.98

[1] All data are final.

[2] Average number of men at work each day oven was active. Because absenteeism and labor turnover are taken into consideration, this number is lower than the number of men available for work, as measured by a count of names on payroll.

[3] Average in which operating time of each plant is weighted by average number of workers in the plant.

[4] Man-days and man-hours of employment have been rounded to the nearest thousand and will not necessarily add to published totals.

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an average 8-hour shift in 1963 and produced 1.573 tons of coke per man-hour. There was no work stoppage in 1963.

Beehive Ovens.—No fatalities occurred at beehive ovens in 1963. Nonfatal injuries increased 53 percent in number and 27 percent in frequency of occurrence over those of 1962. The steady decline in employees of the last 5 years continued, but man-hours increased 6 percent. Employees averaged 1,634 hours while working a 7.8-hour shift.

OIL AND GAS

Injury experience for the oil and gas industry in 1963 indicated a 2-percent improvement in the frequency rate of injuries (fatal and nonfatal) per million man-hours of exposure. This improvement was the result of a 3-percent decrease in injuries and a 1-percent decrease in man-hours. The number of permanent partial disabilities decreased 25 percent, and the number of temporary total disabilities decreased 1 percent.

Disabling injuries in 1963 comprised 93 fatal, 8 permanent total, 347 permanent partial, and 8,770 temporary total disabilities. The average severity of all injuries in 1963 was 110 days, a 6-percent improvement over 1962. For permanent partial and temporary total disabilities the average time loss was 45 days, 4 days higher than in 1962. The severity rate for all injuries was 1,040 days per million man-hours, compared with 1,124 in 1962.

The five segments of the industry that improved their injury experience were drilling, pipeline gas, marketing, research and engineering, and miscellaneous. The severity rates of injuries improved in 8 of the 12 departments in 1963, while the following 4 suffered increased rates: production, natural gasoline, pipeline gas, and marine transportation (ocean and coastwise). Reduced rates occurred in both frequency and severity in the drilling, marketing, research and engineering, and miscellaneous departments.

TABLE 3.—Employment and injury experience of the oil industry (all activities) and the natural gas industry (excluding distribution activities) in the United States, 1959–63.

Year	Average men working daily	Man-hours worked (thousand)	Number of injuries [1]		Injury rate per million man-hours
			Fatal	Nonfatal	
1959	559,244	1,185,146	120	10,543	9.00
1960	511,107	1,063,332	82	9,110	8.64
1961	452,721	951,743	111	8,697	9.25
1962	469,256	984,172	121	9,336	9.61
1963	461,021	974,877	93	9,125	9.46

[1] Fatal and permanent total injuries combined for 1959 through 1962. Permanent total injuries are included in the nonfatal injury total for 1963.

PEAT

Injury experience in the peat extracting and processing industry improved greatly in 1963. The 11 nonfatal injuries reported by the industry occurred at a rate of 11.49 per million man-hours of exposure, decreases of 42 percent in number and 41 percent in the rate of

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occurrence from comparable data for 1962. Active operations were reported in 24 States, 1 more than in 1962. The number of active operations increased from 120 in 1962 to 124 in 1963.

Of the 11 nonfatal injuries sustained, 1 was a permanent partial injury resulting from the use of a handtool. A total of 488 days was lost during the year owing to disabling work injuries, or 67 percent more than in 1962 when 293 days were lost. The five injuries that occurred in the extraction of peat resulted in a frequency rate of 13.13, while the processing segment of the industry sustained six injuries at a rate of 10.41. Slips or falls of persons, handling materials, handtools, haulage, and machinery accidents caused two injuries each, while miscellaneous causes accounted for one.

A total of 674 employees worked 1,420 hours each during the year, accumulating 0.96 million man-hours. When compared with data for 1962, decreases of 1 percent in the number of men employed and 2 percent in man-hours were noted. Peat operations were active 163 days during 1963, 6 days fewer than in 1962. The average workday of 8.4 hours in 1962 increased slightly to 8.7 hours in 1963.

TABLE 4.—Employment and injury experience of the peat industry in the United States, 1959–63

Year	Average men working daily	Man-hours worked (thousand)	Number of injuries		Injury rate per million man-hours
			Fatal	Nonfatal	
1959	467	738	1	14	20.33
1960	576	866	----------	24	27.72
1961	765	1,038	----------	17	16.38
1962	683	977	----------	19	19.46
1963	674	957	----------	11	11.49

NATIVE ASPHALT

The 1963 safety record for the native asphalt industry was considerably less favorable than the 1962 record. Two fatalities occurred at a frequency rate of 2.29 per million man-hours of exposure, whereas there were no deaths in 1962. One of the fatalities in 1963 resulted from a machinery accident in an open-pit mine, and the other was from a haulage accident in a processing plant. The 1963 nonfatal injury total of 35 was more than double the 1962 total of 13, and the rate of occurrence increased from 16.25 per million man-hours of exposure in 1962 to 40.11 in 1963. Of the nonfatal injuries reported for 1963, 15 occurred underground, 2 at surface operations, and 9 each at open-pit mines and processing plants. Machinery accidents were the leading cause of nonfatal disability and accounted for seven injuries. The next ranking causes were six injuries from falling objects, five each from handling materials and falls of persons, four from haulage, three each from handtools and roof and rib falls, and one each from a fire and a miscellaneous cause. The average work force increased 16 percent in 1963, and employees worked 9 percent more man-hours than in 1962. A decrease of 19 was noted in the number of days active.

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TABLE 5.—Employment and injury experience at bituminous limestone, bituminous sandstone, and gilsonite mines and mills in the United States, 1960–63 [1]

Year	Average men working daily	Average active days	Man-days worked (thousand)	Man-hours worked (thousand)	Number of injuries		Injury rate per million man-hours
					Fatal	Nonfatal	
1960	445	264	117	948	1	38	41.16
1961	383	256	98	792	1	30	39.17
1962	358	279	100	800	----------	13	16.25
1963	417	260	108	873	2	35	42.41

[1] Prior to 1960, these data were published with the nonmetal industry in Volume I of the Minerals Yearbook.

CONCLUSION

The overall injury-frequency rate decreased in 1963 for all fuel industries except native asphalt. Annual average employment dropped in each of the mineral-fuel industries except native asphalt, for which there was a slight increase over that of 1962. Man-hours of worktime increased in the coal and native asphalt industries, but dropped in other industries. Active mine or plant days are requested from the coal, coke, and native asphalt industries only; days active for these industries increased for coal but decreased for coke and native asphalt.

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Coal and Related Products

Coal—Bituminous and Lignite

By W. H. Young [1] and R. L. Anderson [2]

Contents

	Page		Page
General summary	49	Domestic production—Continued	
Scope of report	51	Mechanical crushing	122
Reserves	52	Treatment for allaying dust	124
Thickness of bituminous coal and lignite seams	54	Thermal drying	126
Domestic production	56	Production by States and counties	129
Production by months and weeks	61	Transportation	143
Summary by States	67	Consumption	147
Number and size of mines	70	Distribution	150
Employment and productivity	73	Relative rate of growth of mineral fuels and waterpower	160
Underground mining	75	Stocks	160
Strip mining	87	Prices	162
Auger mining	102	Lignite	164
Mechanical loading	106	Foreign trade	164
Mechanical cleaning	115	World production	168
Water usage	121	Coal technology	171

GENERAL SUMMARY

PRODUCTION of bituminous coal and lignite increased substantially in 1963 compared with 1962 figures. The major items of production, consumption, exports, and productivity increased. However, certain key items declined. For the fourth year there was no upward trend in mechanization; the percentage of total tonnage mechanically loaded remained the same as in the 3 previous years and the percentage of total tonnage mechanically cleaned was smaller than in the previous year. Furthermore, the percentage of total production mined by stripping and by augers increased. Most significant was the continued decline in average value and employment.

Production.—The output of bituminous coal and lignite in the United States in 1963—459 million tons—was 9 percent greater than the 422 million tons produced in 1962. Production was greater in 1963, largely because of expanded consumption by the electric utilities and an increase in exports.

The major seasonal fluctuation in production, as in the past, resulted from the miners' vacation period of 12 days in midsummer. According to the Bureau of Labor Statistics, U.S. Department of Labor, time lost

[1] Chief, Section of Solid Fuels, Division of Statistics.
[2] Mining engineer, Division of Bituminous Coal.

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because of strikes totaled 234,000 man-days in 1963, compared with 191,000 man-days in 1962.

Trend of Employment.—Employment decreased 2 percent compared with 1962.

Index to Capacity.—As it is impossible for all mines to operate every working day in the year, an estimate of 280 days for calculating potential capacity was suggested some years ago by the coal committee of the American Institute of Mining, Metallurgical and Petroleum Engineers. The average output per day worked in 1963 was 2.2 million tons, which, if applied to 280 days, gives an annual potential output of 627 million tons, compared with the actual production of 459 million tons. This figure is not a measure of practical productive capacity of the industry because railroad coal car availabilities and other factors bearing on the ability of the industry to produce are not reflected in this computation.

Mechanization.—Coal output that was loaded mechanically at underground mines in the United States—86 percent—was the same as in 3 previous years.

Mechanical Cleaning.—Approximately 63 percent of the bituminous coal and lignite mined in the United States in 1963 was mechanically cleaned. The growth of mechanical cleaning closely paralleled that of mechanical mining, partly because more refuse was loaded with the coal. Moreover, the bituminous coal and lignite industry has attempted to meet the consumer demand for cleaner coal. A large part of the remaining 37 percent was handpicked and screened into various sizes at tipples where no mechanical cleaning facilities existed.

Consumption.—Consumption of bituminous coal and lignite in the United States increased 6 percent, principally in electric utilities. The remaining principal types of consumers used slightly more coal than in the previous year.

Trends of Fuel Efficiency.—For the second time in many years, the fuel efficiency of electric-power utilities failed to make a new record; instead, it remained at 0.86 pounds per kilowatt-hour, the same as in 1961 and 1962.

Competition with Oil and Gas.—Although consumption of energy has increased steadily since 1920, the proportion supplied by bituminous coal and lignite has decreased consistently as a result of serious competition from oil and gas. Of total energy consumed in 1963, bituminous coal and lignite furnished 21 percent; anthracite, 1 percent; oil, 41 percent; gas, 33 percent; and waterpower, 4 percent.

Electric utilities consumed 9.3 percent more bituminous coal, 9 percent more gas, and 4.1 percent more fuel oil in 1963.

Stocks.—The reserve supply of bituminous coal and lignite in the hands of industrial consumers and retail coalyards was the same at the beginning and end of the year—70 million tons. However, days supply of coal declined from 59 to 54 days. Stocks on the upper lake docks increased 58,755 tons from January 1 to December 31, 1963.

Exports.—Exports totaled 47 million tons, increasing 23 percent over those of 1962; 33 million tons was shipped overseas and 14 million tons was shipped to Canada.

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SCOPE OF REPORT

These data include all coal produced in the United States except Pennsylvania anthracite, Texas lignite, and bituminous coal and lignite from mines that produced less than 1,000 tons per year.

Throughout the chapter all tonnage figures show net tons of marketable coal and exclude washery and other refuse. "Tons" refers to net or short tons of 2,000 pounds.

Statistics for 1963 are final and are based upon detailed annual reports of production and mine operation furnished by producers. All but a small percentage of the output was covered by the reports submitted. For production not directly reported (chiefly that of small mines), accurate data were obtained from the records of the various State mine departments (which have statutory authority to require such reports) or in a few instances, from railroad carloadings. Thus, complete coverage of all mines producing 1,000 tons a year or more is reported. Inclusion of many small mines that produce less than 1,000 tons per year was not attempted.

TABLE 1.—Salient statistics of the bituminous coal and lignite industry in the United States

Item	1962	1963	Change from 1962 (percent)
Production.....net tons	422,149,325	458,928,175	+8.7
Consumption.....do	387,774,000	409,225,000	+5.5
Stocks at end of year:			
Industrial consumers and retail yards.....do	69,691,000	70,083,000	+.6
Stocks on upper lake docks.....do	2,886,910	2,945,665	+2.0
Imports and exports: [1]			
Imports.....do	232,424	172,224	−25.9
Exports.....do	38,413,424	47,078,435	+22.6
Price indicators, average per net ton:			
Cost of coking coal at merchant coke ovens	$9.69	$9.35	−3.5
Retail price [2]	$17.30	$17.46	+.9
Railroad freight charge [3]	$3.32	[4] $3.39	+2.1
Value f.o.b. mines	$4.48	$4.39	−2.0
Equipment sold:			
Mobile loading machines	113	89	−21.2
Continuous mining machines	149	137	−8.1
Augers	15	36	+140.0
Shuttle cars	186	196	+5.4
Conveyors:			
Gathering and haulage	171	199	+16.4
Room or transfer	58	81	+39.7
Method of mining:			
Hand loaded underground.....net tons	40,345,901	43,015,565	+6.6
Mechanically loaded underground.....do	240,920,467	259,240,835	+7.6
Percentage of total underground production mechanically loaded	85.7	85.8	+.1
Mined by stripping.....net tons	130,300,224	144,140,677	+10.6
Mined at auger mines.....do	10,582,733	12,531,098	+18.4
Mechanically cleaned.....do	271,632,599	289,462,405	+6.6
Number of mines	7,740	7,940	+2.6
Average number of days worked [5]	199	205	+3.0
Average number of men working daily [5]	143,822	141,646	−1.5
Production per man per day [5]	14.72	15.83	+7.5
Fuel efficiency indicator: Pounds of coal per kilowatt-hour at electric power plants [6]	.86	.86	----------

[1] Bureau of the Census.
[2] Bureau of Labor Statistics, U.S. Department of Labor.
[3] Interstate Commerce Commission.
[4] Represents first 3 months only.
[5] Accident Analysis Branch, Bureau of Mines.
[6] Federal Power Commission.

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RESERVES

TABLE 2.—Coal reserves of the United States, January 1, 1960, by States

(Million short tons)

State	Date of publication of estimate	Estimated original reserves				Total	Reserves depleted to Jan. 1, 1960		Remaining reserves, Jan. 1, 1960	Recoverable reserves, Jan. 1, 1960, assuming 50 percent recovery
		Bituminous coal	Subbituminous coal	Lignite	Anthracite and semianthracite		Production [1]	Production plus loss in mining [2]		
ALABAMA [3]	(4)	[5] 13,754		20		[5] 13,774	[6] 23	[6] 46	13,728	6,864
ALASKA	(7)	21,401	[5] 71,136	(8)	2,101	94,638	13	26	94,612	47,306
ARKANSAS	1960	1,816		350	456	2,622	99	198	2,424	1,212
COLORADO	1959	63,203	18,492		90	81,785	506	1,012	80,773	40,387
GEORGIA	1953	100				100	12	24	76	38
ILLINOIS	1953	137,329				[9] 137,329	[10] 474	[10] 948	136,381	68,190
INDIANA	1953	37,293				37,293	1,148	2,296	34,997	17,499
Iowa [11]	1909	29,160				29,160	357	714	28,446	14,223
KANSAS	B–1951 L–1952	[9] 20,774		(12)		[9] 20,774	[10] 13	[10] 26	20,748	10,374
KENTUCKY	(4)	72,318				72,318	2,646	5,292	67,026	33,513
MARYLAND	1953	[9] 1,200				[9] 1,200	[10] 6	[10] 12	1,188	594
MICHIGAN	1950	297				297	46	92	205	102
Missouri	1913	79,362				79,362	287	574	78,788	39,394
MONTANA	1949	2,363	132,151	87,533		222,047	171	342	221,705	110,853
NEW MEXICO	1950	10,948	50,801		6	61,755	125	250	61,505	30,753
NORTH CAROLINA	1955	112				112	1	2	110	55
NORTH DAKOTA	1953			350,910		350,910	96	192	350,718	175,359
OHIO	1960	46,488				46,488	2,052	4,104	42,384	21,192
OKLAHOMA	1957	3,673		(13)		3,673	180	360	3,313	1,656
OREGON	1955	20	180			200	3	6	194	97
PENNSYLVANIA	B–1928 A–1945	75,093			22,805	97,898	13,508	27,016	70,882	35,441
SOUTH DAKOTA	1952			2,033		2,033	1	2	2,031	1,015
TENNESSEE	1959	[14] 1,912				[14] 1,912	[14] 6	[14] 12	1,900	950
TEXAS [15]	B–1909 L–1955	8,000		7,070		15,070	95	190	14,880	7,440
UTAH	(7)	28,222	156			28,378	260	520	27,858	13,929
VIRGINIA	1952	11,696			355	12,051	782	1,564	10,487	5,244
Washington	1929	11,413	[5] 52,442	(8)	23	63,878	149	298	63,580	31,790
WEST VIRGINIA	1940	116,618				116,618	6,369	12,738	103,880	51,940
WYOMING	1950	13,235	[5] 108,319	(8)		121,554	402	804	120,750	60,375
Other States		[16] 620	[17] 4,065	[18] 50		4,735	7	14	4,721	2,360
Total		808,420	437,742	447,966	25,836	1,719,964	[19] 29,837	59,674	1,660,290	830,145

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[1] Production, 1800 through 1885, from "The first century and a quarter of American coal industry," by H. N. Eavenson, privately printed, Pittsburgh, 1942; production, 1886 through 1923, from U.S. Geological Survey Mineral Resources, annual volumes; production, 1924 through 1957, from Bureau of Mines, Minerals Yearbook, annual volumes, augmented for some States by records of State mine inspectors; production, 1958, from Bureau of Mines, Mineral Market Summary 2974, Sept. 9, 1959; production, 1959, from Bureau of Mines weekly coal reports and partly estimated.
[2] Assuming past losses equal past production.
[3] Reserve estimates of States in capital letters supersede earlier estimates of M. R. Campbell.
[4] New estimate from report in preparation or in press.
[5] Remaining reserves, Jan. 1, 1958.
[6] Production 1958 and 1959 only.
[7] New estimate presented for first time in this report.
[8] Small reserves and production of lignite included under subbituminous coal.
[9] Remaining reserves, Jan. 1, 1950.
[10] Production 1950 through 1959.
[11] Reserve estimates of States in lowercase letters were prepared by or under the direction of M. R. Campbell before 1928.
[12] Small reserves of lignite in beds generally less than 30 inches thick.
[13] Remaining reserves, Jan. 1, 1959.
[14] Estimated production 1959 only.
[15] New estimate of lignite reserves; Campbell estimate of bituminous coal reserves.
[16] ARIZONA, CALIFORNIA, Idaho, Nebraska, and Nevada.
[17] ARIZONA, CALIFORNIA, and Idaho.
[18] CALIFORNIA, Idaho, Louisiana, and Nevada.
[19] Less than total recorded production of about 34.8 billion tons. See footnotes 5, 6, 9, 10, 13, and 14.

Source: Averitt, Paul. Coal Reserves of the United States—A Progress Report January 1, 1960. Geol. Survey Bull. 1136, 1961, pp. 10-11.

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From 1955 to 1963, the annual production form did not request information on employment. These figures for men working daily, days worked, man-days worked, and tons per man per day were obtained from the Accident Analysis Branch of the Bureau of Mines.

Statistical procedures are also detailed in the following sections: Production by months and weeks, number and size of mines, mechanical cleaning, production by states and counties, consumption, and stocks.

THICKNESS OF BITUMINOUS COAL AND LIGNITE SEAMS

The Bureau of Mines compiled and published detailed data on thickness of seams for coal mines in 1960.[3] Because of the importance of seam thickness in mining, these data for 1960 follow. See also figure 1.

TABLE 3.—Number and production of bituminous coal and lignite mines in the United States 1960 classified by thickness of seams mined

Item	Less than 2 feet	2 to 3 feet	3 to 4 feet	4 to 5 feet	5 to 6 feet	6 to 7 feet	7 to 8 feet	8 feet and over	Total
Number of mines:									
Underground	35	1,811	2,178	990	449	266	132	128	5,989
Strip	140	510	418	222	106	52	22	60	1,530
Auger	3	71	129	94	40	8	--------	1	346
Total	178	2,392	2,725	1,306	595	326	154	189	7,865
Percentage of mines:									
Underground	0.6	30.2	36.4	16.5	7.5	4.5	2.2	2.1	100.0
Strip	9.2	33.3	27.3	14.5	6.9	3.4	1.5	3.9	100.0
Auger	.9	20.4	37.3	27.2	11.6	2.3	--------	.3	100.0
Total	2.3	30.4	34.6	16.6	7.6	4.1	2.0	2.4	100.0
Production (thousand tons):									
Underground	231	20,851	65,322	49,633	53,928	39,833	29,665	25,425	284,888
Strip	5,660	19,503	32,934	30,456	17,692	7,126	3,546	5,713	122,630
Auger	44	939	2,781	2,965	971	235	--------	59	7,994
Total	5,935	41,293	101,037	83,054	72,591	47,194	33,211	31,197	415,512
Percentage of production:									
Underground	0.1	7.3	22.9	17.4	19.0	14.0	10.4	8.9	100.0
Strip	4.6	15.9	26.9	24.8	14.4	5.8	2.9	4.7	100.0
Auger	.5	11.7	35.0	37.1	12.1	2.9	--------	.7	100.0
Total	1.4	9.9	24.3	20.0	17.5	11.4	8.0	7.5	100.0

[3] Young, W. H., and R. L. Anderson. Thickness of Bituminous Coal and Lignite Seams Mined in 1960. BuMines Inf. Circ. 8118, 1962, 19 pp.

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TABLE 4.—Number of mines, production, output per man per day, and average thickness of seams mined, at underground, strip, and auger bituminous coal and lignite mines in the United States, 1960, by States

State	Underground mines				Strip mines				Auger mines				Total, all mines			
	Number of mines	Production (net tons)	Average output per man per day (tons)	Average thickness of seams mined (feet)	Number of mines	Production (net tons)	Average output per man per day (tons)	Average thickness of seams mined (feet)	Number of mines	Production (net tons)	Average output per man per day (tons)	Average thickness of seams mined (feet)	Number of mines	Production (net tons)	Average output per man per day (tons)	Average thickness of seams mined (feet)
Alabama	135	10,365,340	7.80	4.1	39	2,558,414	14.96	2.8	3	86,893	26.32	2.7	177	13,010,647	8.66	3.8
Alaska	2	66,982	6.01	20.9	6	655,489	15.43	34.6					8	722,471	13.47	34.3
Arizona	2	5,526	2.02	5.5									2	5,526	2.02	5.5
Arkansas	10	112,774	4.24	2.6	10	296,425	13.38	1.8					20	409,199	8.39	2.0
Colorado	87	2,914,437	8.06	7.6	7	692,849	28.46	8.4					94	3,607,286	9.34	7.8
Georgia	2	4,215	1.84	1.5									2	4,215	1.84	1.5
Illinois	59	23,306,901	17.38	7.5	69	22,670,585	30.04	5.0					128	45,977,486	21.94	6.3
Indiana	34	4,752,902	11.96	5.8	47	10,784,967	29.50	4.6					81	15,537,869	20.36	5.0
Iowa	19	200,100	4.51	4.9	25	867,924	18.15	4.5					44	1,068,024	11.58	4.6
Kansas	2	3,584	2.41	2.1	11	884,690	17.11	1.5					13	888,274	16.70	1.5
Kentucky	1,630	44,468,474	10.61	4.3	129	19,672,192	36.16	4.9	105	2,705,826	30.30	4.1	1,864	66,846,492	13.86	4.5
Maryland	48	260,198	4.37	3.2	37	487,636	15.51	4.3					85	747,834	8.22	3.9
Missouri	10	88,273	3.06	3.6	23	2,801,937	11.83	2.2					33	2,890,210	10.88	2.2
Montana (bituminous and lignite)	14	115,993	6.17	6.6	5	197,430	37.34	16.6					19	313,423	13.01	12.9
New Mexico	18	249,762	6.32	6.3	1	45,000	45.00	3.0					19	294,762	7.27	5.8
North Dakota (lignite)	1	2,403	7.30	9.0	31	2,522,552	37.07	11.0					32	2,524,955	36.93	11.0
Ohio	149	9,206,400	10.95	4.9	265	23,883,289	23.59	3.7	56	867,083	42.45	3.8	470	33,956,772	18.13	4.0
Oklahoma	11	247,568	3.10	3.4	15	1,093,965	16.34	1.7					26	1,341,533	9.14	2.0
Pennsylvania	680	44,070,560	9.04	5.5	553	20,875,533	17.03	3.2	49	479,172	18.53	3.6	1,282	65,425,265	10.68	4.8
South Dakota (lignite)					1	20,448	10.10	4.5					1	20,448	10.10	4.5
Tennessee	332	3,938,626	6.70	4.2	71	1,763,913	20.97	2.9	12	227,911	25.93	3.7	415	5,930,450	8.71	3.8
Utah	45	5,954,693	10.71	10.8									45	4,954,693	10.71	10.8
Virginia	1,201	25,819,830	9.44	5.6	35	1,370,864	26.77	4.1	32	647,201	33.04	3.5	1,268	27,837,895	9.92	5.5
Washington	9	211,968	6.30	7.8	1	16,177	9.77	2.9					10	228,145	6.46	7.5
West Virginia	1,479	109,209,989	11.78	5.1	140	6,754,001	13.65	4.9	89	2,980,287	34.30	4.6	1,708	118,944,277	12.07	5.1
Wyoming	10	310,812	7.60	7.5	9	1,713,384	39.20	45.9					19	2,024,196	23.93	40.0
Total	5,989	284,888,310	10.64	5.4	1,530	122,629,664	22.93	5.1	346	7,994,373	31.36	4.2	7,865	415,512,347	12.83	5.3

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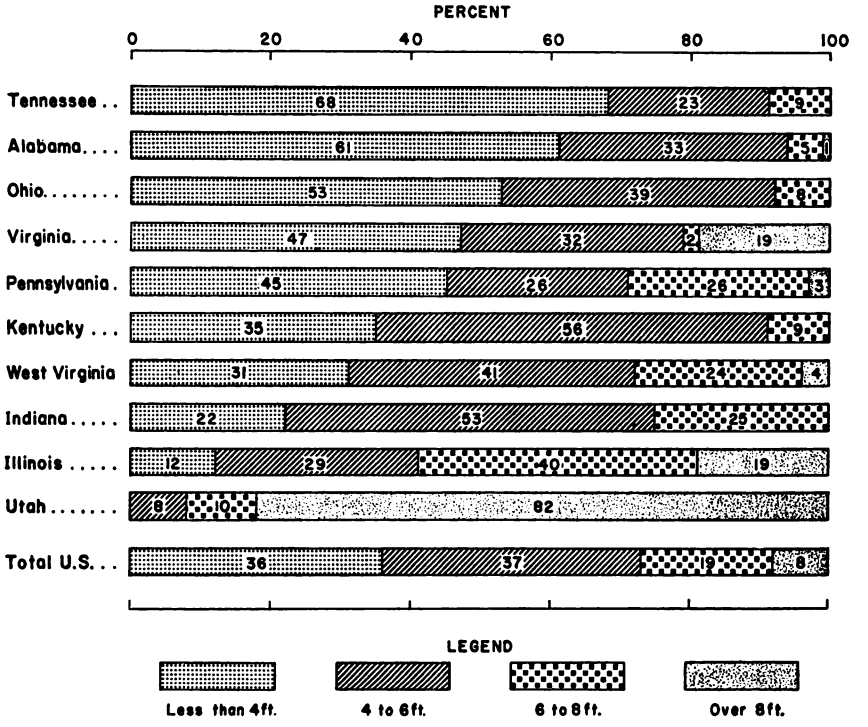

FIGURE 1.—Percentage of bituminous coal and lignite produced in the 10 leading coal-producing States and total United States, 1960, by thickness of seams mined.

DOMESTIC PRODUCTION

TABLE 5.—Growth of the bituminous coal and lignite mining industry in the United States

Year	Production (net tons)	Value of production		Number of mines	Capacity at 280 days (million tons)	Foreign trade [1]	
		Total	Average per ton			Exports (net tons)	Imports (net tons)
1890	111,302,322	$110,420,801	$.99	(2)	137	1,272,396	1,047,416
1891	117,901,238	117,188,400	.99	(2)	148	1,651,694	1,181,677
1892	126,856,567	125,124,381	.99	(2)	162	1,904,556	1,491,800
1893	128,385,231	122,751,618	.96	(2)	174	1,986,383	1,234,499
1894	118,820,405	107,653,501	.91	(2)	196	2,439,720	1,286,268
1895	135,118,193	115,779,771	.86	2,555	196	2,659,987	1,411,323
1896	137,640,276	114,891,515	.83	2,599	202	2,515,838	1,393,095
1897	147,617,519	119,595,224	.81	2,454	213	2,670,157	1,442,534
1898	166,593,623	132,608,713	.80	2,862	221	3,004,304	1,426,108
1899	193,323,187	167,952,104	.87	3,245	230	3,897,994	1,409,838
1900	212,316,112	220,930,313	1.04	(2)	255	6,060,688	1,911,925
1901	225,828,149	236,422,049	1.05	(2)	281	6,455,085	2,214,507
1902	260,216,844	290,858,483	1.12	(2)	316	6,048,777	2,174,393
1903	282,749,348	351,687,933	1.24	(2)	350	5,835,561	4,043,519
1904	278,659,689	305,397,001	1.10	4,650	386	7,206,879	2,179,882

See footnotes at end of table.

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TABLE 5.—Growth of the bituminous coal and lignite mining industry in the United States—Continued

Year	Production (net tons)	Value of production		Number of mines	Capacity at 280 days (million tons)	Foreign trade [1]	
		Total	Average per ton			Exports (net tons)	Imports (net tons)
1905	315,062,785	$334,658,294	$1.06	5,060	417	7,512,723	1,704,810
1906	342,874,867	381,162,115	1.11	4,430	451	8,014,263	2,039,169
1907	394,759,112	451,214,842	1.14	4,550	473	9,869,812	1,892,653
1908	332,573,944	374,135,268	1.12	4,730	482	11,071,152	2,219,243
1909	379,744,257	405,486,777	1.07	5,775	510	10,101,131	1,375,201
1910	417,111,142	469,281,719	1.12	5,818	538	11,663,052	1,819,766
1911	405,907,059	451,375,819	1.11	5,887	538	13,259,791	1,972,555
1912	450,104,982	517,983,445	1.15	5,747	566	16,475,029	1,456,333
1913	478,435,297	565,234,952	1.18	5,776	577	18,013,073	1,767,656
1914	422,703,970	493,309,244	1.17	5,592	608	17,589,562	1,520,962
1915	442,624,426	502,037,688	1.13	5,502	610	18,776,640	1,703,785
1916	502,519,682	665,116,077	1.32	5,726	613	21,254,627	1,713,837
1917	551,790,563	1,249,272,837	2.26	6,939	636	23,839,558	1,448,453
1918	579,385,820	1,491,809,940	2.58	8,319	650	22,350,730	1,457,073
1919	465,860,058	1,160,616,013	2.49	8,994	669	20,113,536	1,011,550
1920	568,666,683	2,129,933,000	3.75	8,921	725	38,517,084	1,244,990
1921	415,921,950	1,199,983,600	2.89	8,038	781	23,131,166	1,257,589
1922	422,268,099	1,274,820,000	3.02	9,299	832	12,413,085	5,059,999
1923	564,564,662	1,514,621,000	2.68	9,331	885	21,453,579	1,882,306
1924	483,686,538	1,062,626,000	2.20	7,586	792	17,100,347	417,226
1925	520,052,741	1,060,402,000	2.04	7,144	748	17,461,560	601,737
1926	573,366,985	1,183,412,000	2.06	7,177	747	35,271,937	485,666
1927	517,763,352	1,029,657,000	1.99	7,011	759	18,011,744	549,843
1928	500,744,970	933,774,000	1.86	6,450	691	16,164,485	546,526
1929	534,988,593	952,781,000	1.78	6,057	679	17,429,298	495,219
1930	467,526,299	795,483,000	1.70	5,891	700	15,877,407	240,886
1931	382,089,396	588,895,000	1.54	5,642	669	12,126,299	206,303
1932	309,709,872	406,677,000	1.31	5,427	594	8,814,047	186,909
1933	333,630,533	445,788,000	1.34	5,555	559	9,036,947	197,429
1934	359,368,022	628,383,000	1.75	6,258	565	10,868,552	179,661
1935	372,373,122	658,063,000	1.77	6,315	582	9,742,430	201,871
1936	439,087,903	770,955,000	1.76	6,875	618	10,654,959	271,798
1937	445,531,449	864,042,000	1.94	6,548	646	13,144,678	257,996
1938	348,544,764	678,653,000	1.95	5,777	602	10,490,269	241,305
1939	394,855,325	728,348,366	1.84	5,820	621	11,590,478	355,115
1940	460,771,500	879,327,227	1.91	6,324	639	16,465,928	371,571
1941	514,149,245	1,125,362,836	2.19	6,822	666	20,740,471	390,049
1942	582,692,937	1,373,990,608	2.36	6,972	663	22,943,305	498,103
1943	590,177,069	1,584,644,477	2.69	6,620	626	25,836,208	757,634
1944	619,576,240	1,810,900,542	2.92	6,928	624	26,032,348	633,689
1945	577,617,327	1,768,204,320	3.06	7,033	620	27,956,192	467,473
1946	533,922,068	1,835,539,476	3.44	7,333	699	41,197,378	434,680
1947	630,623,722	2,622,634,946	4.16	8,700	755	68,666,963	290,141
1948	599,518,229	2,993,267,021	4.99	9,079	774	45,930,133	291,337
1949	437,868,036	2,136,870,571	4.88	8,559	781	27,842,056	314,980
1950	516,311,053	2,500,373,779	4.84	9,429	790	25,468,403	346,706
1951	533,664,732	2,626,030,137	4.92	8,009	736	56,721,547	292,378
1952	466,840,782	2,289,180,401	4.90	7,275	703	47,643,150	262,268
1953	457,290,449	2,247,943,799	4.92	6,671	670	33,760,263	226,900
1954	391,706,300	1,769,619,723	4.52	6,130	603	31,040,564	198,799
1955	464,633,408	2,092,382,737	4.50	7,856	620	51,277,256	337,145
1956	500,874,077	2,412,004,151	4.82	8,520	655	68,552,629	355,701
1957	492,703,916	2,504,406,042	5.08	8,539	680	76,445,529	366,506
1958	410,445,547	1,996,281,274	4.86	8,264	625	50,293,382	306,940
1959	412,027,502	1,965,606,901	4.77	7,719	614	37,253,431	374,713
1960	415,512,347	1,950,425,049	4.69	7,865	609	36,541,075	260,495
1961	402,976,802	1,844,562,662	4.58	7,648	585	34,969,825	164,259
1962	422,149,325	1,891,554,474	4.48	7,740	594	38,413,424	232,424
1963	458,928,175	2,013,309,368	4.39	7,940	627	47,078,435	172,224

See footnotes at end of table.

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TABLE 5.—Growth of the bituminous coal and lignite mining industry in the United States—Continued

Year	Men employed	Average number of days worked	Average days lost per man on strike	Net tons per man—		Percentage of underground production—		Percentage of total production—	
				Per day	Per year	Cut by machines [3]	Mechanically loaded	Mechanically cleaned [4]	Mined by stripping
1890	192,204	226	(2)	2.56	579	(2)	(2)	(2)	(2)
1891	206,803	223	(2)	2.57	573	5.3	(2)	(2)	(2)
1892	212,893	219	(2)	2.72	596	(2)	(2)	(2)	(2)
1893	230,365	204	(2)	2.73	557	(2)	(2)	(2)	(2)
1894	244,603	171	(2)	2.84	486	(2)	(2)	(2)	(2)
1895	239,962	194	(2)	2.90	563	(2)	(2)	(2)	(2)
1896	244,171	192	(2)	2.94	564	11.9	(2)	(2)	(2)
1897	247,817	196	(2)	3.04	596	15.3	(2)	(2)	(2)
1898	255,717	211	(2)	3.09	651	19.5	(2)	(2)	(2)
1899	271,027	234	46	3.05	713	22.7	(2)	(2)	(2)
1900	304,375	234	43	2.98	697	24.9	(2)	(2)	(2)
1901	340,235	225	35	2.94	664	25.6	(2)	(2)	(2)
1902	370,056	230	44	3.06	703	26.8	(2)	(2)	(2)
1903	415,777	225	28	3.02	680	27.6	(2)	(2)	(2)
1904	437,832	202	44	3.15	637	28.2	(2)	(2)	(2)
1905	460,629	211	23	3.24	684	32.8	(2)	(2)	(2)
1906	478,425	213	63	3.36	717	34.7	(2)	2.7	(2)
1907	513,258	234	14	3.29	769	35.1	(2)	2.9	(2)
1908	516,264	193	38	3.34	644	37.0	(2)	3.6	(2)
1909	543,152	209	29	3.34	699	37.5	(2)	3.8	(2)
1910	555,533	217	89	3.46	751	41.7	(2)	3.8	(2)
1911	549,775	211	27	3.50	738	43.9	(2)	(2)	(2)
1912	548,632	228	35	3.68	820	46.8	(2)	3.9	(2)
1913	571,882	232	36	3.61	837	50.7	(2)	4.6	(2)
1914	583,506	195	80	3.71	724	51.8	(2)	4.8	.3
1915	557,456	208	61	3.91	794	55.3	(2)	4.7	.6
1916	561,102	230	26	3.90	896	56.9	(2)	4.6	.8
1917	603,143	243	17	3.77	915	56.1	(2)	4.6	1.0
1918	615,305	249	7	3.78	942	56.7	(2)	3.8	1.4
1919	621,998	195	37	3.84	749	60.0	(2)	3.6	1.2
1920	639,547	220	22	4.00	881	60.7	(2)	3.3	1.5
1921	663,754	149	23	4.20	627	66.4	(2)	3.4	1.2
1922	687,958	142	117	4.28	609	64.8	(2)	(2)	2.4
1923	704,793	179	20	4.47	801	68.3	.3	3.8	2.1
1024	619,604	171	73	4.56	781	71.5	.7	(2)	2.8
1925	568,493	195	30	4.52	884	72.9	1.2	(2)	3.2
1926	593,647	215	24	4.50	966	73.8	1.9	(2)	3.0
1927	593,918	191	153	4.55	872	74.9	3.3	5.3	3.6
1928	522,150	208	83	4.73	959	76.9	4.5	5.7	4.0
1929	502,993	219	11	4.85	1,064	78.4	7.4	6.9	3.8

See footnotes at end of table.

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TABLE 5.—Growth of the bituminous coal and lignite mining industry in the United States—Continued

Year	Men employed	Average number of days worked	Average days lost per man on strike	Net tons per man—		Percentage of underground production—		Percentage of total production—	
				Per day	Per year	Cut by machines [3]	Mechanically loaded	Mechanically cleaned [4]	Mined by stripping
1930	493,202	187	43	5.06	948	81.0	10.5	8.3	4.3
1931	450,213	160	35	5.30	849	83.2	13.1	9.5	5.0
1932	406,380	146	120	5.22	762	84.1	12.3	9.8	6.3
1933	418,703	167	30	4.78	797	84.7	12.0	10.4	5.5
1934	458,011	178	15	4.40	785	84.1	12.2	11.1	5.8
1935	462,403	179	[5] 7	4.50	805	84.2	13.5	12.2	6.4
1936	477,204	199	21	4.62	920	84.8	16.3	13.9	6.4
1937	491,864	193	[5] 19	4.69	906	([2])	20.2	14.6	7.1
1938	441,333	162	13	4.89	790	87.5	26.7	18.2	8.7
1939	421,788	178	36	5.25	936	87.9	31.0	20.1	9.6
1940	439,075	202	8	5.19	1,049	88.4	35.4	22.2	9.2
1941	456,981	216	27	5.20	1,125	89.0	40.7	22.9	10.7
1942	461,991	246	7	5.12	1,261	89.7	45.2	24.4	11.5
1943	416,007	264	[5] 15	5.38	1,419	90.3	48.9	24.7	13.5
1944	393,347	278	[5] 5	5.67	1,575	90.5	52.9	25.6	16.3
1945	383,100	261	[5] 9	5.78	1,508	90.8	56.1	25.6	19.0
1946	[6] 396,434	214	[5] 23	6.30	1,347	90.8	58.4	26.0	21.1
1947	[6] 419,182	234	[5] 5	6.42	1,504	90.0	60.7	27.7	22.1
1948	[6] 441,631	217	[5] 16	6.26	1,358	90.7	64.3	30.2	23.3
1949	[6] 433,698	157	[5] 15	6.43	1,010	91.4	67.0	35.1	24.2
1950	[6] 415,582	183	[5] 56	6.77	1,239	91.8	69.4	38.5	23.9
1951	[6] 372,897	203	[5] 4	7.04	1,429	93.4	73.1	45.0	22.0
1952	[6] 335,217	186	[5] 6	7.47	1,389	92.8	75.6	48.7	23.3
1953	[6] 293,106	191	[5] 3	8.17	1,560	92.3	79.6	52.9	23.1
1954	[6] 227,397	182	[5] 4	9.47	1,724	88.8	84.0	59.4	25.1
1955	[6] 225,093	210	[5] 4	9.84	2,064	88.1	84.6	58.7	24.8
1956	[6] 228,163	214	[5] 4	10.28	2,195	84.6	84.0	58.4	25.4
1957	[6] 228,635	203	[5] 3	10.59	2,155	80.9	84.8	61.7	25.2
1958	[6] 197,402	184	[5] 3	11.33	2,079	75.3	84.9	63.1	28.3
1959	[6] 179,636	188	[5] 24	12.22	2,294	72.1	86.0	65.5	29.4
1960	[6] 169,400	191	[5] 4	12.83	2,453	67.8	86.3	65.7	29.5
1961	[6] 150,474	193	[5] 4	13.87	2,678	64.7	86.3	65.7	30.3
1962	[6] 143,822	199	[5] 6	14.72	2,935	63.3	85.7	64.3	30.9
1963	[6] 141,646	205	[5] 6	15.83	3,240	61.0	85.8	63.1	31.4

[1] Figures for 1890–1914 represent fiscal year ended June 30. [2] Data not available
[3] Percentages for 1890–1913 are of total production, as a separation of underground and strip production is not available for these years. Exclusive of continuous mining which began in 1948.
[4] Percentages for 1906–26 are exclusive of coal cleaned at central washeries operated by consumers.
[5] Bureau of Labor Statistics, U.S. Department of Labor.
[6] Average number of men working daily.

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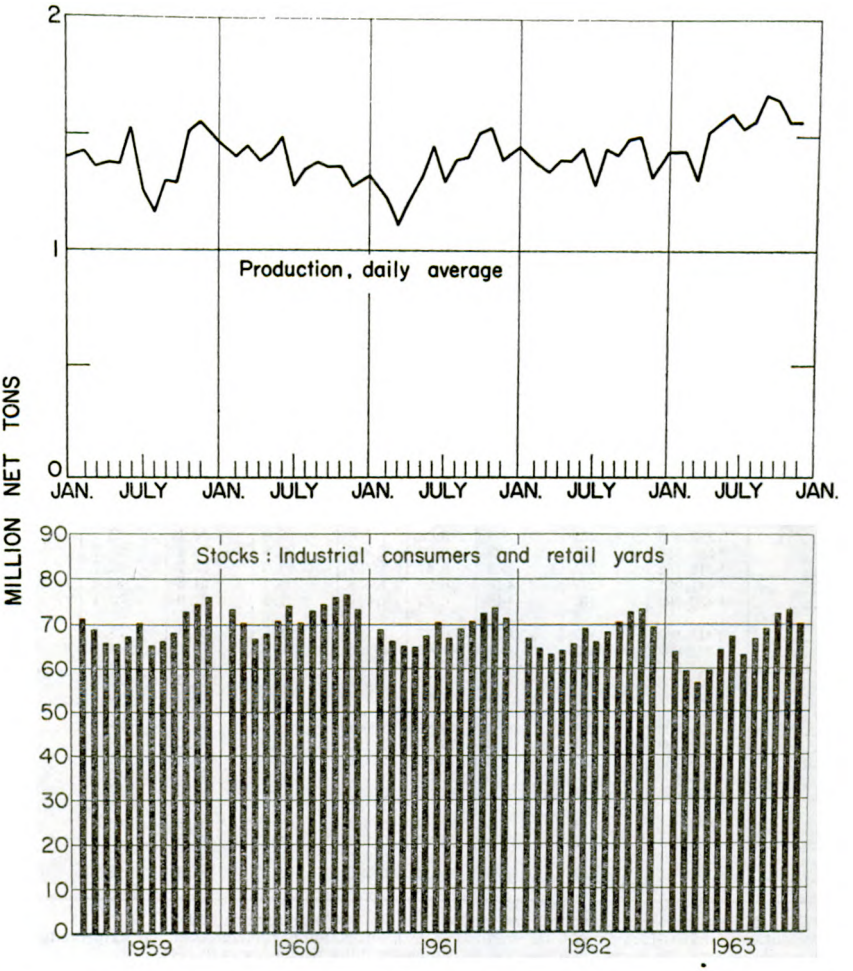

FIGURE 2.—Trends of production and stocks of bituminous coal and lignite in the United States, 1959–63.

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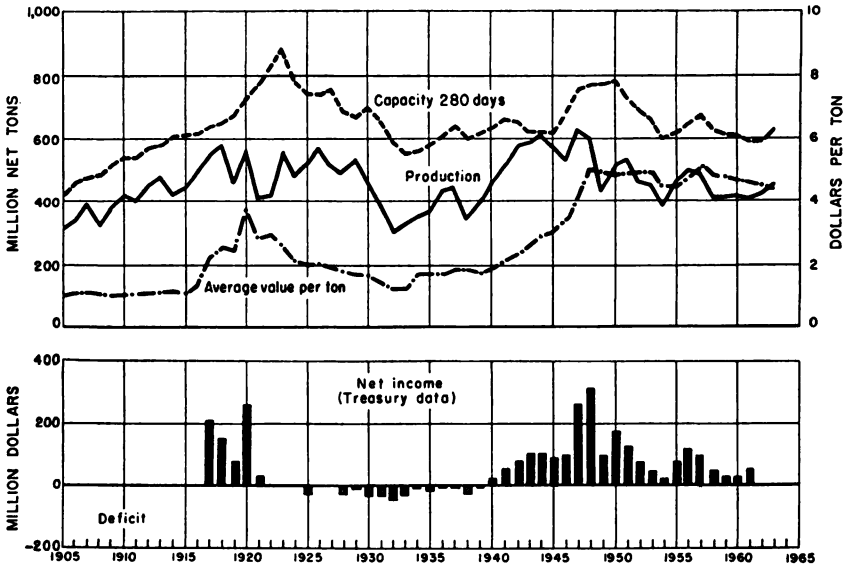

FIGURE 3.—Trends of bituminous coal and lignite production, realization, mine capacity, and net income or deficit in the United States, 1905–63.

PRODUCTION BY MONTHS AND WEEKS

The figures on monthly and weekly production are estimates based upon (1) railroad carloadings of coal reported daily and weekly by all important carriers, (2) shipments on the Allegheny and Monongahela Rivers reported by the U.S. Army Engineers, (3) direct reports from mining companies, and (4) monthly production statements compiled by certain local operators associations and State mine departments. In computing the estimates, allowance is made for commercial truck shipments, local sales, colliery fuel, and small truck mines producing over 1,000 tons a year.

Preliminary estimates are made currently and published in the Weekly Coal Reports. These preliminary estimates have proved very reliable and for many years have been within approximately 1 percent of the final figure of total production, based upon complete coverage of all mines producing over 1,000 tons a year. The preliminary estimates are later revised to agree with the final total production based on the canvass. Thus, the monthly and weekly estimates of production, summarized in tables 6 to 9, represent final figures and vary slightly from the preliminary figures of production published in the Weekly Coal Reports. See also figures 2, 4, and 5.

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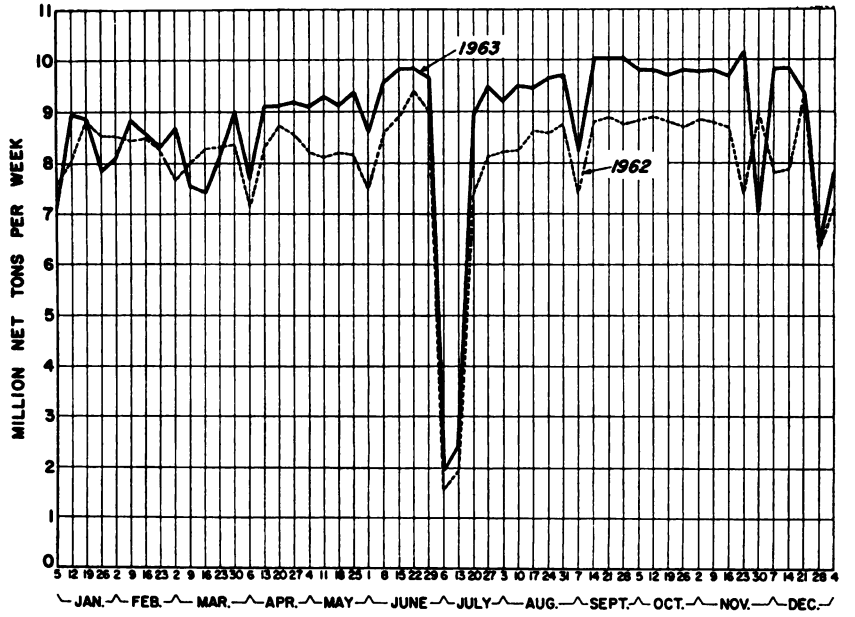

FIGURE 4.—Production of bituminous coal and lignite in the United States, 1962–63, by weeks.

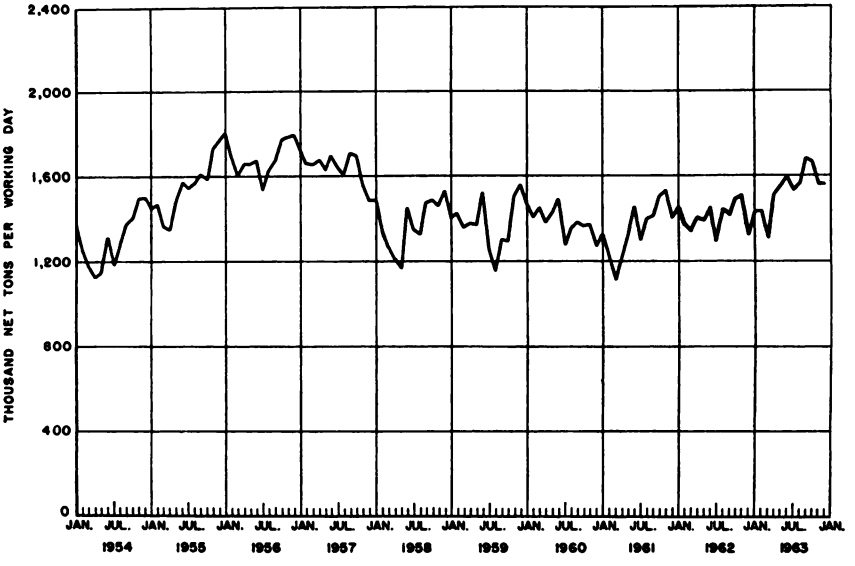
THOUSAND NET TONS PER WORKING DAY
JAN. JUL. JAN. JUL. JAN. JUL. JAN. JUL. JAN. JUL. JAN. JUL. JAN. JUL. JAN. JUL. JAN. JUL. JAN. JUL. JAN.
1954 1955 1956 1957 1958 1959 1960 1961 1962 1963

FIGURE 5.—Average production of bituminous coal and lignite in the United States, per working day in each month, 1954–63.

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TABLE 6.—Production of bituminous coal and lignite in the United States, with estimates by months

Month	Production (thousand net tons)		Maximum number of working days		Average production per working day (thousand net tons)	
	1962	1963	1962	1963	1962	1963
January	37,904	37,301	26	26	1,458	1,435
February	33,154	34,493	24	24	1,381	1,437
March	36,325	34,086	27	26	1,345	1,311
April	34,215	38,579	24.3	25.4	1,408	1,519
May	36,972	41,556	26.5	26.6	1,395	1,562
June	37,602	39,458	25.9	24.7	1,452	1,597
July	22,094	28,070	17.1	18.3	1,292	1,534
August	39,005	42,299	27	27	1,445	1,567
September	34,163	40,320	24	24	1,423	1,680
October	40,323	44,876	27	27	1,493	1,662
November	37,288	38,820	24.8	24.9	1,504	1,559
December	33,104	39,070	25	25	1,324	1,563
Total	422,149	458,928	298.6	298.9	1,414	1,535

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TABLE 7.—Production of bituminous coal and lignite in the United States, 1963, by States, with estimates by months

(Thousand net tons)

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
Alabama	1,153	1,038	1,015	1,053	1,105	1,075	713	1,053	969	1,098	988	1,099	12,359
Alaska	84	79	70	74	49	34	69	67	61	100	81	85	853
Arkansas	20	16	17	18	16	17	17	14	19	22	21	24	221
Colorado	402	314	301	287	280	258	155	232	273	339	362	487	3,690
Georgia	1	1	1								1	1	5
Illinois	4,523	4,049	4,325	4,383	4,525	4,513	2,711	4,535	4,347	4,779	4,291	4,755	51,736
Indiana	1,576	1,478	1,384	1,159	1,196	1,291	745	1,124	1,090	1,253	1,239	1,565	15,100
Iowa	147	151	121	77	75	83	99	105	111	74	90	80	1,213
Kansas	100	93	104	83	97	98	58	118	116	118	119	65	1,169
Kentucky:													
Eastern	3,116	2,811	2,524	3,506	3,738	3,455	3,158	4,119	3,775	4,239	3,658	3,535	41,634
Western	2,941	3,071	2,638	2,815	3,290	3,075	2,116	3,279	3,249	3,448	2,920	2,874	35,716
Total Kentucky	057	5,882	5,162	6,321	7,028	6,530	5,274	7,398	7,024	7,687	6,578	6,409	77,350
Maryland	102	79	81	100	105	89	123	112	90	104	75	102	1,162
Missouri	360	312	282	225	240	225	164	279	176	266	319	326	3,174
Montana:													
Bituminous	6	4	5	5	6		5	5	3	5	4	5	53
Lignite	33	24	26	27	31	3	25	24	19	29	24	25	290
Total Montana	39	28	31	32	37	3	30	29	22	34	28	30	343
New Mexico	152	148	169	193	200	195	58	186	159	122	152	211	1,945
North Dakota (lignite)	307	231	194	118	98	102	105	154	211	237	296	346	2,399
Ohio	2,370	2,088	2,242	2,780	3,239	3,567	2,583	3,759	3,649	4,262	3,437	2,814	36,790
Oklahoma	113	97	94	77	71	98	53	72	92	79	85	77	1,008
Pennsylvania	5,708	5,615	5,630	6,073	6,523	6,139	4,346	6,444	6,254	6,808	5,865	6,096	71,501
South Dakota (lignite)	3	2	2	1	1				1	2	2	2	16
Tennessee	439	358	410	563	595	550	470	615	569	605	506	441	6,121
Utah	532	373	314	368	316	312	131	345	382	422	397	468	4,360
Virginia	2,400	2,226	2,150	2,707	2,947	2,471	2,196	2,822	2,663	3,087	2,454	2,408	30,531
Washington	24	21	20	22	22	13	9	12	7	10	12	18	190
West Virginia	10,312	9,541	9,752	11,653	12,583	11,660	7,780	12,641	11,803	13,054	11,035	10,754	132,568
Wyoming	377	273	215	212	208	135	181	183	232	314	387	407	3,124
Total	37,301	34,493	34,086	38,579	41,556	39,458	28,070	42,299	40,320	44,876	38,820	39,070	458,928

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TABLE 8.—Production of bituminous coal and lignite in the United States, 1963, by districts, with estimates by months

(Thousand net tons)

District	January	February	March	April	May	June	July	August	September	October	November	December	Total
1. Eastern Pennsylvania	2,833	2,765	2,775	3,007	3,226	3,027	2,203	3,196	3,083	3,363	2,883	3,018	35,379
2. Western Pennsylvania	2,995	2,946	2,954	3,187	3,423	3,221	2,280	3,381	3,282	3,572	3,077	3,199	37,517
3. Northern West Virginia	3,083	2,874	2,997	3,531	3,543	3,400	2,313	3,590	3,593	4,003	3,424	3,262	39,613
4. Ohio	2,370	2,088	2,242	2,780	3,239	3,567	2,583	3,759	3,649	4,262	3,437	2,814	36,790
5. Michigan													
6. Panhandle	385	359	374	441	442	425	289	448	449	500	428	407	4,947
7. Southern Numbered 1	2,932	2,704	2,721	3,293	3,674	3,317	2,273	3,658	3,316	3,676	3,067	3,024	37,655
8. Southern Numbered 2	9,784	8,929	8,665	11,059	12,095	10,892	8,645	12,388	11,346	12,693	10,639	10,360	127,495
9. West Kentucky	2,941	3,071	2,638	2,815	3,290	3,075	2,116	3,279	3,249	3,448	2,920	2,874	35,716
10. Illinois	4,523	4,049	4,325	4,383	4,525	4,513	2,711	4,535	4,347	4,779	4,291	4,755	51,736
11. Indiana	1,576	1,478	1,384	1,159	1,196	1,291	745	1,124	1,090	1,253	1,239	1,565	15,100
12. Iowa	147	151	121	77	75	83	99	105	111	74	90	80	1,213
13. Southeastern	1,219	1,092	1,077	1,137	1,193	1,157	783	1,145	1,054	1,188	1,064	1,166	13,275
14. Arkansas-Oklahoma	65	55	55	49	44	56	38	43	56	54	55	55	625
15. Southwestern	528	463	442	354	380	382	254	440	347	431	489	437	4,947
16. Northern Colorado	112	62	63	52	47	32	5	34	50	69	77	119	722
17. Southern Colorado	313	275	264	265	264	256	159	226	247	289	308	400	3,266
18. New Mexico	129	125	143	163	169	165	49	158	135	103	129	179	1,647
19. Wyoming	377	273	215	212	208	135	181	183	232	314	387	407	3,124
20. Utah	532	373	314	368	316	312	131	345	382	422	397	468	4,360
21. North-South Dakota	310	233	196	119	99	102	105	154	212	239	298	348	2,415
22. Montana	39	28	31	32	37	3	30	29	22	34	28	30	343
23. Washington	108	100	90	96	71	47	78	79	68	110	93	103	1,043
Total	37,301	34,493	34,086	38,579	41,556	39,458	28,070	42,299	40,320	44,876	38,820	39,070	458,928

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TABLE 9.—Production of bituminous coal and lignite in the United States, with estimates by weeks

1962				1963			
Week ended—	Production (thousand net tons)	Maximum number of working days	Average production per working day (thousand net tons)	Week ended—	Production (thousand net tons)	Maximum number of working days	Average production per working day (thousand net tons)
Jan. 6	7,554	5	1,511	Jan. 5	5,632	[1] 4	[2] 1,420
Jan. 13	8,044	6	1,341	Jan. 12	8,941	6	1,490
Jan. 20	8,854	6	1,476	Jan. 19	8,836	6	1,473
Jan. 27	8,529	6	1,422	Jan. 26	7,852	6	1,309
Feb. 3	8,527	6	1,421	Feb. 2	8,125	6	1,354
Feb. 10	8,439	6	1,407	Feb. 9	8,855	6	1,476
Feb. 17	8,495	6	1,416	Feb. 16	8,553	6	1,426
Feb. 24	8,252	6	1,375	Feb. 23	8,297	6	1,383
Mar. 3	7,684	6	1,281	Mar. 2	8,709	6	1,452
Mar. 10	7,987	6	1,331	Mar. 9	7,548	6	1,258
Mar. 17	8,312	6	1,385	Mar. 16	7,431	6	1,239
Mar. 24	8,333	6	1,389	Mar. 23	8,116	6	1,353
Mar. 31	8,373	6	1,396	Mar. 30	8,985	6	1,498
Apr. 7	7,141	5.3	1,347	Apr. 6	7,716	5.4	1,429
Apr. 14	8,297	6	1,383	Apr. 13	9,123	6	1,521
Apr. 21	8,739	6	1,457	Apr. 20	9,119	6	1,520
Apr. 28	8,540	6	1,423	Apr. 27	9,191	6	1,532
May 5	8,216	6	1,369	May 4	9,097	6	1,516
May 12	8,124	6	1,354	May 11	9,308	6	1,551
May 19	8,204	6	1,367	May 18	9,127	6	1,521
May 26	8,152	6	1,359	May 25	9,353	6	1,559
June 2	7,504	5.5	1,364	June 1	8,609	5.6	1,537
June 9	8,624	6	1,437	June 8	9,550	6	1,592
June 16	8,853	6	1,476	June 15	9,858	6	1,643
June 23	9,390	6	1,565	June 22	9,871	6	1,645
June 30	9,005	5.9	1,526	June 29	9,671	5.7	1,697
July 7	1,541	1	1,541	July 6	1,958	1	1,958
July 14	1,951	2.1	929	July 13	2,431	2.3	1,057
July 21	7,363	6	1,227	July 20	8,947	6	1,491
July 28	8,127	6	1,355	July 27	9,475	6	1,579
Aug. 4	8,207	6	1,368	Aug. 3	9,214	6	1,536
Aug. 11	8,257	6	1,376	Aug. 10	9,521	6	1,587
Aug. 18	8,641	6	1,440	Aug. 17	9,465	6	1,578
Aug. 25	8,587	6	1,431	Aug. 24	9,625	6	1,604
Sept. 1	8,755	6	1,459	Aug. 31	9,733	6	1,622
Sept. 8	7,390	5	1,478	Sept. 7	8,231	5	1,646
Sept. 15	8,803	6	1,467	Sept. 14	10,055	6	1,676
Sept. 22	8,875	6	1,479	Sept. 21	10,042	6	1,674
Sept. 29	8,765	6	1,461	Sept. 28	10,037	6	1,673
Oct. 6	8,831	6	1,472	Oct. 5	9,812	6	1,635
Oct. 13	8,927	6	1,488	Oct. 12	9,819	6	1,637
Oct. 20	8,820	6	1,470	Oct. 19	9,710	6	1,618
Oct. 27	8,689	6	1,448	Oct. 26	9,812	6	1,635
Nov. 3	8,847	6	1,475	Nov. 2	9,770	6	1,628
Nov. 10	8,788	6	1,465	Nov. 9	9,808	6	1,635
Nov. 17	8,683	5.8	1,497	Nov. 16	9,705	5.9	1,645
Nov. 24	7,396	5	1,479	Nov. 23	10,167	6	1,695
Dec. 1	8,939	6	1,490	Nov. 30	7,048	5	1,410
Dec. 8	7,802	6	1,300	Dec. 7	9,854	6	1,642
Dec. 15	7,872	6	1,312	Dec. 14	9,852	6	1,642
Dec. 22	9,337	6	1,556	Dec. 21	9,325	6	1,554
Dec. 29	6,316	5	1,263	Dec. 28	6,449	5	1,290
Jan. 5	[1] 1,468	[1] 1	[2] 1,420	Jan. 4	3,500	[1] 2	[2] 1,570
Total	422,149	298.6	1,414	Total	458,928	298.9	1,535

[1] Figures represent output and number of working days in that part of week included in calendar year shown. Total production for the week ending January 5, 1963, was 7,100,000 net tons and for the week ending January 4, 1964, was 7,850,000 net tons.

[2] Average daily output for the entire week and not for working days in the calendar year shown.

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SUMMARY BY STATES

TABLE 10.—Bituminous coal and lignite produced in the United States, by States, with production of maximum year and cumulative production from earliest record to end of 1963

(Thousand net tons)

State	Maximum production		Production, by years										Total production from earliest record to end of 1963
	Year	Quantity	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	
Alabama	1926	21,001	10,282	13,088	12,663	13,260	11,182	11,947	13,011	12,915	12,880	12,359	997,799
Arkansas	1907	2,670	477	578	590	508	364	441	409	395	256	221	99,539
Colorado	1917	12,483	2,900	3,568	3,502	3,594	2,974	3,294	3,607	3,678	3,379	3,690	520,867
Illinois	1918	89,291	41,971	45,932	48,102	46,993	43,912	45,466	45,977	45,246	48,487	51,736	3,797,396
Indiana	1918	30,679	13,400	16,149	17,089	15,841	15,022	14,804	15,538	15,106	15,709	15,100	1,210,616
Iowa	1917	8,966	1,197	1,258	1,358	1,312	1,179	1,180	1,068	927	1,130	1,213	355,845
Kansas	1918	7,562	1,372	742	884	749	823	772	888	664	915	1,169	282,859
Kentucky	1947	84,241	56,964	69,020	74,555	74,667	66,312	62,810	66,847	63,032	69,212	77,350	2,921,184
Maryland	1907	5,533	422	512	669	748	838	842	748	757	821	1,162	269,699
Missouri	1917	5,671	2,514	3,232	3,283	2,976	2,592	2,748	2,890	2,938	2,896	3,174	298,291
Montana	1944	4,844	1,491	1,247	846	413	305	345	313	371	382	343	172,127
New Mexico	1918	4,023	123	201	158	137	117	148	295	412	677	1,945	128,437
North Dakota	1950	3,261	[1]	3,102	2,815	2,561	2,314	2,413	2,525	2,726	2,733	2,399	[2] 103,500
Ohio	1920	45,878	32,469	37,870	38,934	36,862	32,028	35,112	33,957	32,226	34,125	36,790	2,194,711
Oklahoma	1920	4,849	1,915	2,164	2,007	2,195	1,630	1,525	1,342	1,031	1,048	1,008	183,903
Pennsylvania	1918	178,551	72,010	85,713	90,287	85,365	67,771	65,347	65,425	62,652	65,315	71,501	8,493,723
Tennessee	1956	8,848	6,429	7,053	8,848	7,955	6,785	5,913	5,931	5,860	6,213	6,121	412,623
Utah	1947	7,429	5,008	6,296	6,522	6,858	5,328	4,545	4,955	5,159	4,297	4,360	276,684
Virginia	1963	30,531	16,387	23,508	28,063	29,506	26,826	29,769	27,838	30,332	29,474	30,531	906,122
Washington	1918	4,082	619	610	473	360	252	242	228	191	235	190	149,114
West Virginia	1947	176,157	115,996	139,168	155,891	156,842	119,468	119,692	118,944	113,071	118,499	132,568	6,835,126
Wyoming	1945	9,847	2,831	2,927	2,553	2,117	1,629	1,977	2,024	2,529	2,569	3,124	411,852
Other States [3]			4,929	695	782	885	795	696	752	759	897	874	188,052
Total	1947	630,624	391,706	464,633	500,874	492,704	410,446	412,028	415,512	402,977	422,149	458,928	31,210,069

[1] North Dakota included in "Other States" in 1954 to avoid disclosing individual operations.

[2] Excludes production of North Dakota in 1954 to avoid disclosing individual operations.

[3] Production, if any, in Alaska, Arizona, California, Georgia, Idaho, Michigan, North Carolina, Oregon, South Dakota, or Texas included in "Other States."

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TABLE 11.—Number of mines, production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1963, by States

State	Number of active mines	Production (net tons)				Average value per ton[3]	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day
		Shipped by rail or water[1]	Shipped by truck	Used at mine[2]	Total					
Alabama	180	10,434,294	1,165,217	759,451	12,358,962	$7.38	5,348	206	1,103,980	11.19
Alaska	5	831,807	13,024	8,567	853,398	6.93	196	255	49,906	17.10
Arkansas	11	212,926	7,704	20	220,650	6.82	137	172	23,620	9.34
Colorado	82	2,737,076	875,278	78,158	3,690,512	5.93	1,427	203	289,122	12.76
Georgia	1		4,550		4,550	3.63	15	112	1,680	2.71
Illinois	108	45,833,898	5,797,549	104,869	51,736,316	3.80	8,159	244	1,988,566	26.02
Indiana	64	12,221,669	2,157,413	720,597	15,099,679	3.78	2,793	222	620,302	24.34
Iowa	32	878,576	333,331	1,082	1,212,989	3.50	382	210	80,039	15.15
Kansas	10	896,460	269,839	2,380	1,168,679	4.54	237	241	57,050	20.49
Kentucky	1,993	66,292,444	10,985,780	72,227	77,350,451	3.82	24,263	187	4,540,747	17.03
Maryland	70	631,705	530,263		1,161,968	3.73	526	188	98,706	11.77
Missouri	24	1,966,122	397,724	810,656	3,174,502	4.16	486	247	119,840	26.49
Montana:										
Bituminous	11	5,061	48,015	390	53,466	7.51	73	109	7,928	6.74
Lignite	4	284,364	5,163	5	289,532	1.95	24	205	4,917	58.88
Total Montana	15	289,425	53,178	395	342,998	2.82	97	132	12,845	26.70
New Mexico	10	717,458	26,347	1,201,045	1,944,850	2.89	304	197	59,845	32.50
North Dakota (lignite)	30	1,807,955	324,462	266,571	2,398,988	2.19	312	206	64,333	37.29
Ohio	447	20,628,043	11,526,548	4,635,239	36,789,830	3.70	7,936	228	1,811,724	20.31
Oklahoma	15	967,791	39,865		1,007,656	5.63	354	195	69,163	14.57
Pennsylvania	1,182	55,600,494	14,431,656	1,468,803	71,500,953	4.90	26,434	202	5,326,612	13.42
South Dakota (lignite)	1		16,286	275	16,561	3.74	8	183	1,460	11.34
Tennessee	266	3,746,875	2,368,412	5,777	6,121,064	3.71	3,170	168	533,717	11.47
Utah	36	3,908,201	435,507	15,823	4,359,531	5.22	1,569	188	295,327	14.76
Virginia	1,495	26,555,983	3,770,766	204,246	30,530,995	3.96	12,358	207	2,559,169	11.93
Washington	7	138,199	47,238	4,788	190,225	7.26	201	190	38,154	4.99
West Virginia	1,839	125,780,928	4,249,052	2,537,783	132,567,763	4.79	44,534	206	9,181,048	14.44
Wyoming	17	1,574,298	1,074,451	475,356	3,124,105	3.18	400	173	69,258	45.11
Total	7,940	384,652,627	60,901,440	13,374,108	458,928,175	4.39	141,646	205	28,996,213	15.83

[1] Includes coal loaded at mine directly into railroad cars or river barges, hauled by trucks to railroad sidings, and hauled by trucks to waterways.

[2] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

[3] Value received or charged for coal, f.o.b. mine. Includes a value, estimated by producer, for coal not sold.

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TABLE 12.—Number of mines, production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1963, by districts

District	Number of active mines	Production (net tons)				Average value per ton [3]	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day
		Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total					
1. Eastern Pennsylvania	900	27,800,984	6,827,722	750,297	35,379,003	$4.17	13,374	200	2,674,760	13.23
2. Western Pennsylvania	367	28,588,258	8,210,542	718,510	37,517,310	5.53	13,715	202	2,771,725	13.54
3. Northern West Virginia	549	38,265,383	1,317,078	30,577	39,613,038	4.52	12,614	204	2,568,641	15.42
4. Ohio	447	20,628,043	11,526,548	4,635,239	36,789,830	3.70	7,936	228	1,811,724	20.31
5. Michigan										
6. Panhandle	17	2,301,485	406,652	2,238,273	4,946,410	4.20	1,143	244	278,829	17.74
7. Southern Numbered 1	860	35,782,478	1,701,991	171,194	37,655,663	5.65	15,506	205	3,185,756	11.82
8. Southern Numbered 2	3,982	113,917,646	13,212,104	365,046	127,494,796	4.22	49,085	194	9,512,634	13.40
9. West Kentucky	99	31,403,124	4,297,561	14,914	35,715,599	3.32	5,127	225	1,151,979	31.00
10. Illinois	108	45,833,898	5,797,549	104,869	51,736,316	3.80	8,159	244	1,988,566	26.02
11. Indiana	64	12,221,669	2,157,413	720,597	15,099,679	3.78	2,793	222	620,302	24.34
12. Iowa	32	878,576	333,331	1,082	1,212,989	3.50	382	210	80,039	15.15
13. Southeastern	252	10,983,365	1,532,046	759,476	13,274,887	7.16	6,084	197	1,201,335	11.05
14. Arkansas-Oklahoma	16	612,378	12,312	20	624,710	7.06	232	182	42,197	14.80
15. Southwestern	44	3,430,921	702,820	813,036	4,946,777	4.30	982	232	227,476	21.75
16. Northern Colorado	7	473,540	240,104	8,593	722,237	4.11	230	198	45,634	15.83
17. Southern Colorado	78	2,556,625	639,946	69,847	3,266,418	6.34	1,334	200	266,636	12.25
18. New Mexico	7	424,369	21,575	1,200,763	1,646,707	2.33	167	220	36,697	44.87
19. Wyoming	17	1,574,298	1,074,451	475,356	3,124,105	3.18	400	173	69,258	45.11
20. Utah	36	3,908,201	435,507	15,823	4,359,531	5.22	1,569	188	295,327	14.76
21. North-South Dakota	31	1,807,955	340,748	266,846	2,415,549	2.20	320	206	65,793	36.71
22. Montana	15	289,425	53,178	395	342,998	2.82	97	132	12,845	26.70
23. Washington	12	970,006	60,262	13,355	1,043,623	6.99	397	222	88,060	11.85
Total	7,940	384,652,627	60,901,440	13,374,108	458,928,175	4.39	141,646	205	28,996,213	15.83

[1] Includes coal loaded at mine directly into railroad cars or river barges, hauled by trucks to railroad sidings, and hauled by trucks to waterways.

[2] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

[3] Value received or charged for coal, f.o.b. mine. Includes a value, estimated by producer, for coal not sold.

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NUMBER AND SIZE OF MINES

The unit in the statistical record is the mine, and operating companies are requested to make a separate report for each mine because its location is definitely known and can be related to a specific district or county; its identity can be followed through successive changes of ownership; and it is the natural operating unit from the standpoint of cost, mechanical equipment, mining practice, and output per man per day. See figure 6.

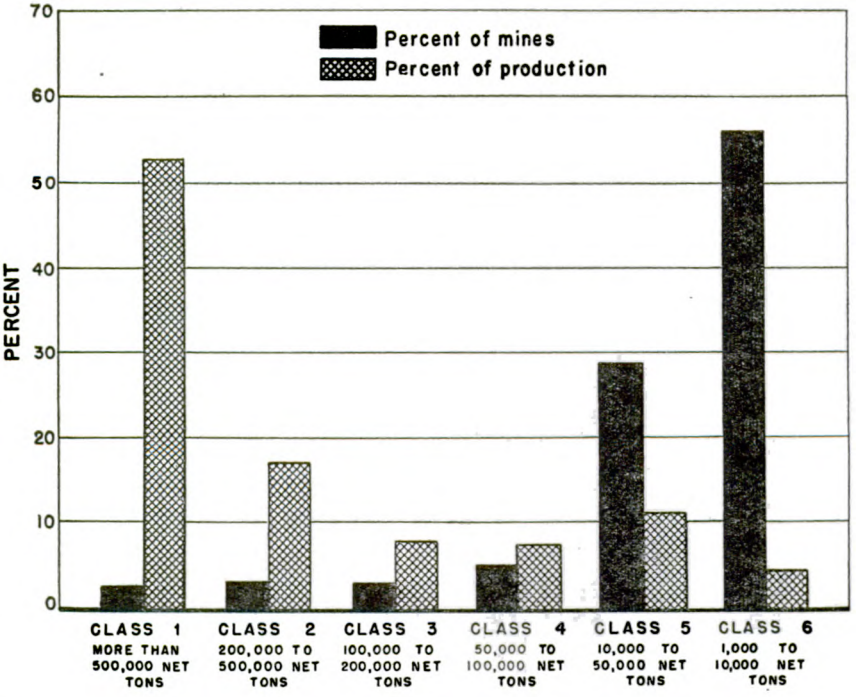

FIGURE 6.—Percentage of number of mines and of production of bituminous coal and lignite mines in the United States, 1963, by size of output.

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TABLE 13.—Number and production of bituminous coal and lignite mines in the United States, 1963, by States and size of output

State	Class 1—500,000 tons and over				Class 2—200,000 to 500,000 tons				Class 3—100,000 to 200,000 tons			
	Mines		Production		Mines		Production		Mines		Production	
	Number	Percentage	Net tons	Percentage	Number	Percentage	Net tons	Percentage	Number	Percentage	Net tons	Percentage
Alabama	5	2.8	6,011,299	48.6	8	4.4	2,831,615	22.9	10	5.6	1,349,965	10.9
Alaska	1	20.0	554,673	65.0	1	20.0	203,945	23.9				
Arkansas												
Colorado	1	1.2	749,542	20.3	4	4.9	1,360,259	36.9	4	4.9	474,472	12.8
Georgia												
Illinois	37	34.3	45,811,105	88.6	13	12.0	3,862,767	7.5	4	3.7	565,106	1.1
Indiana	15	23.4	12,766,146	84.5	3	4.7	1,225,756	8.1	3	4.7	324,202	2.2
Iowa					1	3.1	206,366	17.0	3	9.4	405,981	33.5
Kansas	1	10.0	749,032	64.1					2	20.0	372,957	31.9
Kentucky	28	1.4	38,404,018	49.7	26	1.3	8,233,175	10.6	44	2.2	5,883,919	7.6
Maryland									3	4.3	494,011	42.5
Missouri	3	12.5	2,058,074	64.9	2	8.3	875,755	27.6				
Montana (bituminous and lignite)					1	6.7	284,364	82.9				
New Mexico	1	10.0	1,200,763	61.8	2	20.0	704,056	36.2				
North Dakota (lignite)	1	3.3	711,926	29.7	3	10.0	908,002	37.8	3	10.0	495,764	20.7
Ohio	15	3.4	18,199,754	49.5	22	4.9	5,901,829	16.0	31	6.9	4,175,537	11.3
Oklahoma					2	13.3	500,615	49.7	3	20.0	339,990	33.7
Pennsylvania	34	2.9	32,265,928	45.1	39	3.3	13,078,770	18.3	63	5.3	8,668,998	12.1
South Dakota (lignite)												
Tennessee	1	.4	532,050	8.7	4	1.5	1,241,498	20.3	7	2.6	937,479	15.3
Utah	2	5.6	1,208,915	27.7	4	11.1	1,417,310	32.5	9	25.0	1,209,260	27.7
Virginia	5	.3	8,452,105	27.7	13	.9	4,255,005	13.9	6	.4	787,688	2.6
Washington									1	14.3	122,459	64.4
West Virginia	73	4.0	71,849,084	54.2	90	4.8	28,756,108	21.7	64	3.5	9,107,053	6.9
Wyoming	1	5.9	1,022,430	32.7	4	23.5	1,563,659	50.1	2	11.8	285,709	9.1
Total	224	2.8	242,547,744	52.9	242	3.0	77,410,854	16.8	262	3.3	36,009,500	7.8

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TABLE 13.—Number and production of bituminous coal and lignite mines in the United States, 1963, by States and size of output—Con.

State	Class 4— 50,000 to 100,000 tons				Class 5— 10,000 to 50,000 tons				Class 6— less than 10,000 tons				Total		
	Mines		Production		Mines		Production		Mines		Production		Mines	Production (net tons)	
	Number	Percentage	Net tons	Percentage	Number	Percentage	Net tons	Percentage	Number	Percentage	Net tons	Percentage		Total	Average per mine
Alabama	12	6.7	875,889	7.1	44	24.4	882,172	7.2	101	56.1	408,022	3.3	180	12,358,962	68,661
Alaska	1	20.0	84,971	10.0					2	40.0	9,809	1.1	5	853,398	170,680
Arkansas	1	9.1	80,686	36.6	6	54.5	127,972	58.0	4	36.4	11,992	5.4	11	220,650	20,059
Colorado	7	8.5	455,506	12.3	21	25.6	482,141	13.1	45	54.9	168,592	4.6	82	3,690,512	45,006
Georgia									1	100.0	4,550	100.0	1	4,550	4,550
Illinois	13	12.0	998,133	1.9	14	13.0	382,162	.7	27	25.0	117,043	.2	108	51,736,316	479,040
Indiana	5	7.8	284,600	1.9	17	26.6	396,815	2.6	21	32.8	102,160	.7	64	15,099,679	235,932
Iowa	3	9.4	187,851	15.5	11	34.4	342,315	28.2	14	43.7	70,476	5.8	32	1,212,989	37,906
Kansas					1	10.0	26,177	2.2	6	60.0	20,513	1.8	10	1,168,679	116,868
Kentucky	116	5.8	7,262,881	9.4	595	29.9	12,056,228	15.6	1,184	59.4	5,510,230	7.1	1,993	77,350,451	38,811
Maryland	3	4.3	198,436	17.1	18	25.7	313,476	27.0	46	65.7	156,045	13.4	70	1,161,968	16,600
Missouri	1	4.2	73,000	2.3	5	20.8	118,192	3.7	13	54.2	48,581	1.5	24	3,174,502	132,271
Montana (bituminous and lignite)									14	93.3	58,634	17.1	15	342,998	22,867
New Mexico					1	10.0	20,000	1.0	6	60.0	20,031	1.0	10	1,944,850	194,485
North Dakota (lignite)	1	3.3	58,172	2.4	6	20.0	148,024	6.2	16	53.4	77,100	3.2	30	2,398,988	79,966
Ohio	56	12.5	4,065,226	11.1	144	32.2	3,662,009	10.0	179	40.1	785,475	2.1	447	36,789,830	82,304
Oklahoma	1	6.7	65,227	6.5	3	20.0	84,802	8.4	6	40.0	17,022	1.7	15	1,007,656	67,177
Pennsylvania	108	9.1	7,679,474	10.7	315	26.7	7,323,018	10.3	623	52.7	2,484,765	3.5	1,182	71,500,953	60,492
South Dakota (lignite)					1	100.0	16,561	100.0					1	16,561	16,561
Tennessee	12	4.5	901,900	14.7	82	30.8	1,898,107	31.0	160	60.2	610,030	10.0	266	6,121,064	23,012
Utah	2	5.6	164,958	3.8	11	30.5	326,556	7.5	8	22.2	32,532	.8	36	4,359,531	121,098
Virginia	67	4.5	3,931,978	12.9	402	26.9	8,595,929	28.1	1,002	67.0	4,508,290	14.8	1,495	30,530,995	20,422
Washington					2	28.6	43,769	23.0	4	57.1	23,997	12.6	7	190,225	27,175
West Virginia	88	4.8	6,245,556	4.7	548	29.8	12,471,708	9.4	976	53.1	4,138,254	3.1	1,839	132,567,763	72,087
Wyoming	2	11.8	130,973	4.2	3	17.6	102,402	3.3	5	29.4	18,932	.6	17	3,124,105	183,771
Total	499	6.3	33,745,417	7.4	2,250	28.4	49,820,535	10.9	4,463	56.2	19,403,075	4.2	7,940	458,928,175	57,800

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EMPLOYMENT AND PRODUCTIVITY

The bituminous coal and lignite industry has become highly mechanized in recent years. Mechanization has strongly affected production per man per day and the number of employees. In the past 20 years productivity has increased 194 percent and the number of employees has declined 66 percent. See figure 7.

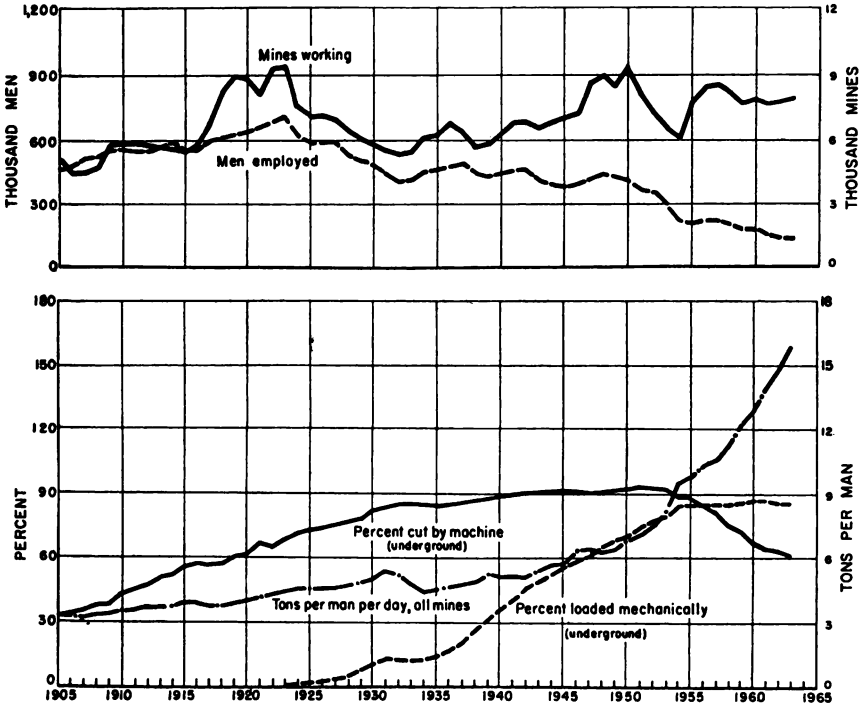

FIGURE 7.—Trends of employment, mechanization, and output per man at bituminous coal and lignite mines in the United States, 1905–63.

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TABLE 14.—Production and average output per man per day at bituminous coal and lignite mines in the United States, 1963, by States and by underground, strip, and auger mining

State	Production (net tons)				Percentage of total production				Average tons per man per day			
	Underground	Strip	Auger	Total	Underground	Strip	Auger	Total	Underground	Strip	Auger	Total
Alabama	9,465,520	2,792,803	100,639	12,358,962	76.6	22.6	.8	100.0	9.60	24.44	25.63	11.19
Alaska		853,398		853,398		100.0		100.0		17.10		17.10
Arkansas	75,218	145,432		220,650	34.1	65.9		100.0	5.73	13.87		9.34
Colorado	2,833,929	856,583		3,690,512	76.8	23.2		100.0	10.65	37.08		12.76
Georgia	4,550			4,550	100.0			100.0	2.71			2.71
Illinois	24,449,006	27,287,310		51,736,316	47.3	52.7		100.0	20.75	33.68		26.02
Indiana	4,160,196	10,939,483		15,099,679	27.6	72.4		100.0	13.74	34.45		24.34
Iowa	156,838	1,056,151		1,212,989	12.9	87.1		100.0	5.59	20.31		15.15
Kansas	1,715	1,166,964		1,168,679	.1	99.9		100.0	2.00	20.77		20.49
Kentucky	47,478,208	25,752,222	4,120,021	77,350,451	61.4	33.3	5.3	100.0	12.21	47.12	39.16	17.03
Maryland	425,509	736,459		1,161,968	36.6	63.4		100.0	6.25	24.06		11.77
Missouri	30,634	3,136,868	7,000	3,174,502	1.0	98.8	.2	100.0	3.00	28.75	17.50	26.49
Montana:												
Bituminous	50,466	3,000		53,466	94.4	5.6		100.0	6.80	5.91		6.74
Lignite	5,168	284,364		289,532	1.8	98.2		100.0	4.49	75.51		58.88
Total Montana	55,634	287,364		342,998	16.2	83.8		100.0	6.49	67.24		26.70
New Mexico	313,402	1,631,448		1,944,850	16.1	83.9		100.0	10.23	55.85		32.50
North Dakota (lignite)	1,880	2,397,108		2,398,988	.1	99.9		100.0	9.00	37.38		37.29
Ohio	10,488,588	24,407,420	1,893,822	36,789,830	28.5	66.3	5.2	100.0	12.64	25.91	47.41	20.31
Oklahoma	53,360	954,296		1,007,656	5.3	94.7		100.0	2.84	18.93		14.57
Pennsylvania	46,102,430	24,467,772	930,751	71,500,953	64.5	34.2	1.3	100.0	11.55	18.85	24.31	13.42
South Dakota (lignite)		16,561		16,561		100.0		100.0		11.34		11.34
Tennessee	3,379,490	2,490,737	250,847	6,121,064	55.2	40.7	4.1	100.0	7.80	26.28	43.12	11.47
Utah	4,359,531			4,359,531	100.0			100.0	14.76			14.76
Virginia	26,793,030	2,301,051	1,436,914	30,530,995	87.8	7.5	4.7	100.0	10.90	34.40	41.60	11.93
Washington	182,868	7,357		190,225	96.1	3.9		100.0	4.85	15.36		4.99
West Virginia	121,327,345	7,449,314	3,791,104	132,567,763	91.5	5.6	2.9	100.0	13.81	24.97	40.22	14.44
Wyoming	117,529	3,006,576		3,124,105	3.8	96.2		100.0	7.32	56.52		45.11
Total	302,256,400	144,140,677	12,531,098	458,928,175	65.9	31.4	2.7	100.0	12.78	28.69	38.87	15.83

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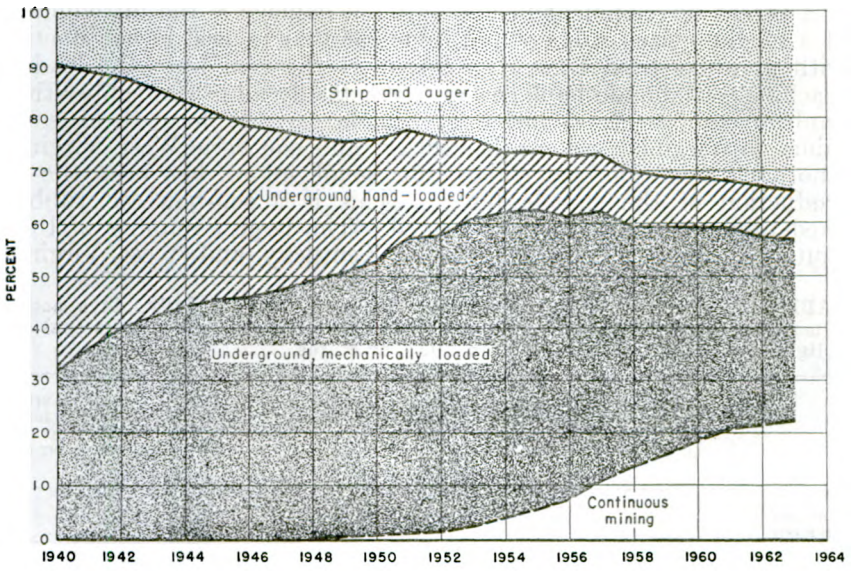

FIGURE 8.—Percentage of total production of bituminous coal and lignite in the United States, 1940–63, by type of mining and loading.

UNDERGROUND MINING

Two-thirds of the output of bituminous coal and lignite is mined underground. The major tasks underground are cutting, drilling shotholes, loading, and haulage. Loading is discussed later in the section on mechanical loading. For many years most of the underground production has been cut by machine; however, as the percentage of production by continuous-mining machines increases, the percentage cut by machines will decrease. The use of power drills for shotholes increased rapidly from less than 50 percent of the underground production in 1940 to a maximum of 84 percent in 1953. The use of continuous-mining machines decreased the tonnage powderdrilled for shotholes to 64 percent of the underground output. Trolley locomotives are the principal method of underground haulage; however, in recent years the use of conveyor haulage has increased steadily.

Mines producing 60 percent of the underground output reported 103,925 rail mine cars and 3,843 miles of rail track, while mines producing 6 percent used rubber-tired mine cars. Mines not reporting type of haulage produced 10 percent, and mines employing 100 percent conveyor haulage furnished the remaining 24 percent of the underground production.

The largest number of mine cars—27 percent—were 4- to 5-ton capacity. However, 11 percent of all rail mine cars were large, 10 tons and over, hauling the largest amount—28 percent—of the tonnage handled by rail mine cars. In contrast, the most frequent size of rubber-tired mine cars was 2-ton capacity; cars of this size hauled 54 percent of the tonnage handled by rubber-tired mine cars.

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A recent development in underground haulage is the introduction of a medium-sized rubber-tired mine car that is used in conjunction with a rubber-tired tractor to transport the coal from the loading machine to the main haulageway. Practically all of the rubber-tired haulage equipment, exclusive of shuttle cars, is located in small mines in Virginia, eastern Kentucky, and southern West Virginia. Another innovation, particularly for small mines, has been the introduction of the shuttle buggy. This is a self-powered rubber-tired mine car which is hand-loaded. The largest number of these shuttle buggies is used in eastern Kentucky and West Virginia.

TABLE 15.—Number of mines, production, men working daily, days active, man-days, and output per man per day at underground bituminous coal and lignite mines in the United States, 1963, by States.

State	Number of active mines	Production (net tons)	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day
Alabama	129	9,465,520	4,730	208	985,776	9.60
Arkansas	6	75,218	80	164	13,134	5.73
Colorado	74	2,833,929	1,317	202	266,018	10.65
Georgia	1	4,550	15	112	1,680	2.71
Illinois	44	24,449,006	5,160	228	1,178,352	20.75
Indiana	26	4,160,196	1,545	196	302,738	13.74
Iowa	13	156,838	174	161	28,042	5.59
Kansas	1	1,715	6	143	858	2.00
Kentucky	1,778	47,478,208	20,787	187	3,889,031	12.21
Maryland	39	425,509	369	185	68,095	6.25
Missouri	5	30,634	71	145	10,317	3.00
Montana:						
Bituminous	10	50,466	67	111	7,420	6.80
Lignite	3	5,168	9	128	1,151	4.49
Total Montana	13	55,634	76	113	8,571	6.49
New Mexico	7	313,402	195	157	30,636	10.23
North Dakota (lignite)	1	1,880	3	70	209	9.00
Ohio	119	10,488,588	3,812	218	829,658	12.64
Oklahoma	4	53,360	136	138	18,756	2.84
Pennsylvania	592	46,102,430	19,369	206	3,990,223	11.55
Tennessee	200	3,379,480	2,566	169	433,135	7.80
Utah	36	4,359,531	1,569	188	295,327	14.76
Virginia	1,406	26,793,030	11,855	207	2,457,731	10.90
Washington	6	182,868	196	192	37,675	4.85
West Virginia	1,624	121,327,345	42,417	207	8,788,446	13.81
Wyoming	5	117,529	142	113	16,066	7.32
Total	6,129	302,256,400	116,590	203	23,650,474	12.78

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TABLE 16.—Underground production of bituminous coal and lignite in the United States, 1963, by States and mining methods

State	Cut by hand and shot from solid		Cut by machines				Mined by continuous-mining machines		Total underground (net tons)
	Net tons	Percentage of total underground	Net tons	Percentage of total underground	Number of coal-cutting machines	Average output per machine (net tons)	Net tons	Percentage of total underground	
Alabama	175,510	1.9	9,126,564	96.4	150	60,844	163,446	1.7	9,465,520
Arkansas	300	.4	74,918	99.6	10	7,492			75,218
Colorado	136,645	4.8	1,163,550	41.1	130	8,950	1,533,734	54.1	2,833,929
Georgia			4,550	100.0	1	4,550			4,550
Illinois			15,655,663	64.0	91	172,040	8,793,343	36.0	24,449,006
Indiana	5,124	.1	3,670,796	88.2	65	56,474	484,276	11.7	4,160,196
Iowa	20,426	13.0	136,412	87.0	13	10,493			156,838
Kansas			1,715	100.0	1	1,715			1,715
Kentucky	4,003,125	8.4	39,130,175	82.4	1,321	29,622	4,344,908	9.2	47,478,208
Maryland	82,009	19.3	271,691	63.8	35	7,763	71,809	16.9	425,509
Missouri			30,634	100.0	9	3,404			30,634
Montana:									
Bituminous			50,466	100.0	17	2,969			50,466
Lignite	3,846	74.4	1,322	25.6	2	661			5,168
Total Montana	3,846	6.9	51,788	93.1	19	2,726			55,634
New Mexico	11,204	3.6	8,827	2.8	5	1,765	293,371	93.6	313,402
North Dakota (lignite)	1,880	100.0							1,880
Ohio	26,477	.3	6,402,918	61.0	171	37,444	4,059,193	38.7	10,488,588
Oklahoma	2,668	5.0	8,566	16.1	3	2,855	42,126	78.9	53,360
Pennsylvania	616,232	1.3	12,700,522	27.6	665	19,099	32,785,676	71.1	46,102,430
Tennessee	327,513	9.7	2,739,852	81.1	128	21,405	312,115	9.2	3,379,480
Utah			2,193,295	50.3	67	32,736	2,166,236	49.7	4,359,531
Virginia	4,614,289	17.2	19,990,716	74.6	707	28,275	2,188,025	8.2	26,793,030
Washington	84,901	46.4					97,967	53.6	182,868
West Virginia	3,386,801	2.8	70,926,413	58.5	1,697	41,795	47,014,131	38.7	121,327,345
Wyoming			117,529	100.0	21	5,597			117,529
Total	13,498,950	4.5	184,407,094	61.0	5,309	34,735	104,350,356	34.5	302,256,400

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TABLE 17.—Summary of drilling operations at underground bituminous coal and lignite mines in the United States

Year	Number of mines using power drills	Number of power drills [1]					Production (thousand net tons)—				Production, percent—		
		Electric	Face or coal	Compressed air	Roof or rock	Total	Where shotholes are power-drilled	Where shotholes are hand-drilled	Where no shotholes are required (continuous mining)	Total	Where shotholes are power-drilled	Where shotholes are hand-drilled	Where no shotholes are required (continuous mining)
1936	599	3,968	----------	1,302	----------	5,270	111,950	299,012	----------	410,962	27.2	72.8	----------
1937	[2]	[2]	----------	[2]	----------	[2]	[2]	[2]	----------	413,780	[2]	[2]	----------
1938	1,061	5,071	----------	1,465	----------	6,536	122,581	195,557	----------	318,138	38.5	61.5	----------
1939	[2]	[2]	----------	[2]	----------	[2]	[2]	[2]	----------	357,133	[2]	[2]	----------
1940	1,172	6,613	----------	1,378	----------	7,991	197,083	220,521	----------	417,604	47.2	52.8	----------
1941	1,266	7,697	----------	1,502	----------	9,199	237,213	221,865	----------	459,078	51.7	48.3	----------
1942	1,364	8,482	----------	1,564	----------	10,046	281,530	233,960	----------	515,490	54.6	45.4	----------
1943	1,376	8,930	----------	1,630	----------	10,560	299,805	210,687	----------	510,492	58.7	41.3	----------
1944	1,501	9,755	----------	1,903	----------	11,658	324,116	194,562	----------	518,678	62.5	37.5	----------
1945	1,504	10,267	----------	1,855	----------	12,122	302,786	164,844	----------	467,630	64.7	35.3	----------
1946	1,702	10,968	----------	1,884	----------	12,852	278,734	142,224	----------	420,958	66.2	33.8	----------
1947	2,522	12,940	----------	1,449	----------	14,389	351,866	139,363	----------	491,229	71.6	28.4	----------
1948	2,798	13,970	----------	1,312	----------	15,282	336,873	122,689	450	460,012	73.2	26.7	0.1
1949	2,923	14,087	----------	1,411	----------	15,498	251,329	77,894	2,600	331,823	75.7	23.5	.8
1950	3,112	14,277	----------	1,282	----------	15,559	286,661	101,333	4,850	392,844	73.0	25.8	1.2
1951	3,027	14,231	----------	1,345	----------	15,576	324,645	85,136	6,061	415,842	78.0	20.5	1.5
1952	2,830	13,468	----------	1,292	----------	14,760	284,048	64,162	8,215	356,425	79.7	18.0	2.3
1953	2,486	12,054	----------	1,053	----------	13,107	293,161	44,560	11,830	349,551	83.9	12.7	3.4
1954	2,137	10,782	----------	885	----------	11,667	233,557	39,219	16,336	289,112	80.7	13.6	5.7
1955	2,003	9,533	----------	476	----------	10,009	285,348	30,657	27,460	343,465	83.1	8.9	8.0
1956	4,033	[1]	11,021	[1]	2,443	13,464	306,675	19,192	39,907	365,774	83.8	5.3	10.9
1957	4,152	[1]	10,938	[1]	2,981	13,919	294,186	12,680	53,783	360,649	81.6	3.5	14.9
1958	4,410	[1]	9,691	[1]	2,947	12,638	216,226	14,285	56,373	286,884	75.4	5.0	19.6
1959	3,979	[1]	8,524	[1]	2,814	11,338	207,043	10,599	65,792	283,434	73.1	3.7	23.2
1960	4,294	[1]	8,265	[1]	2,840	11,105	194,956	12,004	77,928	284,888	68.4	4.2	27.4
1961	4,333	[1]	7,837	[1]	3,153	10,990	181,741	6,704	84,321	272,766	66.6	2.5	30.9
1962	4,660	[1]	7,744	[1]	3,121	10,865	187,324	3,768	90,174	281,266	66.6	1.4	32.0
1963	4,868	[1]	7,496	[1]	2,913	10,409	193,036	4,870	104,350	302,256	63.9	1.6	34.5

[1] Total number of power drills before 1956 are not strictly comparable with the figures for 1956 to date. Data were collected by "type" of drills before 1956 and by "use" of drills 1956 to date. Most of the "electric" drills were used in coal and most of the "compressed air" drills were used in rock. "Face or coal" drills include hand-held, post-mounted, and mobile drills. "Roof or rock" drills include rotary and percussion drills.

[2] Data not available.

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TABLE 18.—Use of power drills in underground bituminous coal and lignite mines in the United States, 1963, by States

State	Number of mines using power drills	Number of power drills						Production where shotholes are power-drilled (net tons)			
		Face or coal drills		Roof or rock drills				Handheld and post-mounted drills	Mobile drills	Total	Percentage of total underground
		Handheld and post-mounted	Mobile	Roof bolting		Other uses					
				Rotary	Percussion	Rotary	Percussion				
Alabama	80	194	7	45	40	21	16	8,721,859	488,502	9,210,361	97.3
Arkansas	4	8		1		3		65,826		65,826	87.5
Colorado	64	178	6	5	24		1	1,372,896	173,399	1,546,295	54.6
Georgia	1	1						4,550		4,550	100.0
Illinois	44	27	151	118		2	5	415,319	15,240,344	15,655,663	64.0
Indiana	26	30	30	38		1	1	377,636	3,298,284	3,675,920	88.4
Iowa	8	11	2	2		1		40,478	99,661	140,139	89.4
Kentucky	1,407	1,828	140	247	108	16	33	24,791,598	17,423,948	42,215,546	88.9
Maryland	22	43		2		1		269,815		269,815	63.4
Missouri	2	2						23,474		23,474	76.6
Montana:											
Bituminous	10	12	1	1				44,246	6,220	50,466	100.0
Lignite	3	4						5,168		5,168	100.0
Total Montana	13	16	1	1				49,414	6,220	55,634	100.0
New Mexico	4	5		2	8			12,917		12,917	4.1
North Dakota (lignite)	1	1						1,880		1,880	100.0
Ohio	110	127	38	68	4			899,028	5,506,860	6,405,888	61.1
Oklahoma	1	2						6,626		6,626	12.4
Pennsylvania	331	536	52	236	306	27	92	6,060,711	6,193,596	12,254,307	26.6
Tennessee	95	147	2	5	6	5	1	2,677,738	22,111	2,699,849	79.9
Utah	35	53	54	6	100	1	66	1,298,015	1,546,655	2,844,670	65.3
Virginia	1,332	1,160	21	50	42		4	18,000,903	4,678,135	22,679,038	84.6
Washington	5	32						77,036		77,036	42.1
West Virginia	1,278	2,346	215	727	347	26	49	52,225,479	20,847,594	73,073,073	60.2
Wyoming	5	30		3				117,529		117,529	100.0
Total	4,868	6,777	719	1,556	985	104	268	117,510,727	75,525,309	193,036,036	63.9

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TABLE 19.—Number of underground bituminous coal and lignite mines and number of haulage units in use in the United States, in selected years [1]

Year	Underground mines	Locomotives				Rope-haulage units			Shuttle cars			Gathering and haulage conveyors	Animals
		Trolley	Battery	Other types	Total	Portable	Stationary	Total	Cable reel	Battery	Total		
1924	7,352	[2] 12,765	1,515	443	14,723	[3]	[3]	649	[3]	[3]	[3]	[3]	36,352
1946	5,888	14,110	1,011	110	15,231	4,084	1,009	5,093	[3]	[3]	[3]	457	10,185
1948	7,108	14,617	904	74	15,595	3,886	1,044	4,930	[3]	[3]	[3]	755	10,834
1949	6,798	14,090	928	59	15,077	3,904	1,073	4,977	2,144	623	2,767	860	10,313
1950	7,559	13,822	949	62	14,833	4,225	1,037	5,262	2,782	512	3,294	1,013	10,033
1951	6,225	13,327	900	51	14,278	3,875	916	4,791	3,191	567	3,758	1,094	7,478
1952	5,632	12,545	812	41	13,398	3,584	852	4,436	3,382	462	3,844	1,066	6,555
1953	5,034	11,311	678	45	12,034	2,838	727	3,565	3,797	425	4,222	1,042	5,354
1954	4,653	10,155	762	38	10,955	1,926	781	2,707	4,400	431	4,831	1,081	5,409
1955	6,035	9,538	658	40	10,236	1,327	577	1,904	4,375	239	4,614	1,002	6,440
1956	6,542	9,445	861	102	10,408	1,420	575	1,995	4,757	257	5,014	1,114	6,097
1957	6,512	8,997	898	138	10,033	1,214	616	1,830	5,129	257	5,386	1,233	5,054
1958	6,319	8,057	920	138	9,115	926	538	1,464	4,871	259	5,130	1,235	4,678
1959	5,815	7,263	949	137	8,349	900	504	1,404	4,795	255	5,050	1,416	4,063
1960	5,989	6,922	946	173	8,041	892	510	1,402	4,722	236	4,958	1,566	3,503
1961	5,843	6,362	583	162	7,107	[4]	[4]	[4]	4,687	182	4,869	1,635	[4]
1962	5,946	5,874	461	123	6,458	[4]	[4]	[4]	4,746	212	4,958	1,786	[4]
1963	6,129	5,273	484	113	5,870	[4]	[4]	[4]	4,952	175	5,127	1,998	[4]

[1] Exclusive of lignite and Virginia semianthracite mines in 1946, 1948, and 1949.
[2] Includes combination trolley and battery locomotives.
[3] Data not available.
[4] Canvass discontinued.

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TABLE 20.—Haulage units and length of rail track in use in bituminous coal and lignite underground mines in the United States, 1963, by States

State	Locomotives			Tractors, rubber-tired	Mine cars [1]		Shuttle cars		Shuttle buggies	Gathering and haulage conveyors		Rail track reported (miles)		
	Trolley	Battery	All others		Rail	Rubber-tired	Cable reel	Battery		Units	Miles	Main line	All other	Total
Alabama	130			27	3,128	4	175	2		69	27.1	84.0	47.4	131.4
Arkansas		1			78							1.4		1.4
Colorado	79	32	1		2,794		104	15	2	21	5.6	37.0	16.0	53.0
Illinois	115	27	10	5	2,905	19	269	2		141	59.9	52.5	20.5	73.0
Indiana	84	2	1	25	1,207	7	90		1	28	6.5	48.8	27.4	76.2
Iowa	4	2			574		5					11.2	.4	11.6
Kentucky	773	120	6	218	9,714	1,045	781	60	583	197	67.7	345.4	130.5	475.9
Maryland	4	5		3	200	19	3		5	3	.9	5.4	1.4	6.8
Missouri		1			36							1.2	.2	1.4
Montana:														
Bituminous	8	1			153		4					4.0	2.0	6.0
Lignite			1	1	3	3						1.0		1.0
Total Montana	8	1	1	1	156	3	4					5.0	2.0	7.0
New Mexico	10				162		10			1	.3	5.7	1.7	7.4
Ohio	174	22	3	5	3,544	9	123		3	56	12.9	93.2	32.2	125.4
Oklahoma		5			12							.5	.2	.7
Pennsylvania	1,430	100	28	44	29,406	73	918	33	31	403	122.0	902.2	323.4	1,225.6
Tennessee	76	5		5	775	57	49		41	7	1.8	24.7	10.6	35.3
Utah	124	4		5	3,294	2	173	6		51	10.3	75.4	25.9	101.3
Virginia	364	95	43	645	3,963	3,662	188		27	97	40.6	113.5	36.6	150.1
Washington	13				452		2					1.6		1.6
West Virginia	1,885	58	20	344	41,473	1,337	2,052	57	784	921	270.4	1,003.0	353.0	1,356.0
Wyoming		4			52		6			3	.9	1.5	.5	2.0
Total	5,273	484	113	1,327	103,925	6,237	4,952	175	1,477	1,998	626.9	2,813.2	1,029.9	3,843.1

[1] See table 21 for percentage coverage.

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TABLE 21.—Method of haulage at bituminous coal and lignite underground mines in the United States, 1963, by States

State	Production (net tons) from mines—					Percentage of total underground production from mines—				
	Reporting rail mine cars	Reporting rubber-tired mine cars	With conveyor haulage only	Not reporting type of haulage	Total	Reporting rail mine cars	Reporting rubber-tired mine cars	With conveyor haulage only	Not reporting type of haulage	Total
Alabama	5,005,931		3,673,816	785,773	9,465,520	52.9		38.8	8.3	100.0
Arkansas	23,392			51,826	75,218	31.1			68.9	100.0
Colorado	1,261,292		1,309,618	263,019	2,833,929	44.5		46.2	9.3	100.0
Illinois	7,934,360	40,085	15,939,258	535,303	24,449,006	32.4	.2	65.2	2.2	100.0
Indiana	2,371,000	26,587	1,753,609	9,000	4,160,196	57.0	.6	42.2	.2	100.0
Iowa	154,776			2,062	156,838	98.7			1.3	100.0
Kentucky	19,986,050	3,258,153	11,636,495	12,597,510	47,478,208	42.1	6.9	24.5	26.5	100.0
Maryland	111,180	66,040	135,236	113,053	425,509	26.1	15.5	31.8	26.6	100.0
Missouri	20,054			10,580	30,634	65.5			34.5	100.0
Montana:										
Bituminous	47,002			3,464	50,466	93.1			6.9	100.0
Lignite	1,193	1,322		2,653	5,168	23.1	25.6		51.3	100.0
Total Montana	48,195	1,322		6,117	55,634	86.6	2.4		11.0	100.0
New Mexico	308,051			5,351	313,402	98.3			1.7	100.0
Ohio	9,731,730	21,139	591,732	143,987	10,488,588	92.8	.2	5.6	1.4	100.0
Oklahoma	4,608			48,752	53,360	8.6			91.4	100.0
Pennsylvania	37,111,217	389,015	7,529,596	1,072,602	46,102,430	80.5	.9	16.3	2.3	100.0
Tennessee	1,857,906	122,186	204,449	1,194,939	3,379,480	55.0	3.6	6.0	35.4	100.0
Utah	3,632,699	16,481	487,204	223,147	4,359,531	83.3	.4	11.2	5.1	100.0
Virginia	5,865,118	8,765,343	6,234,889	5,927,680	26,793,030	21.9	32.7	23.3	22.1	100.0
Washington	175,003			7,865	182,868	95.7			4.3	100.0
West Virginia	85,815,289	3,809,937	24,344,101	7,358,018	121,327,345	70.7	3.2	20.0	6.1	100.0
Wyoming	38,204			79,325	117,529	32.5			67.5	100.0
Other States [1]				8,145	8,145				100.0	100.0
Total	181,456,055	16,516,288	73,840,003	30,444,054	302,256,400	60.0	5.5	24.4	10.1	100.0

[1] Includes Georgia, Kansas, and North Dakota (lignite).

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TABLE 22.—Rail mine cars used at bituminous coal and lignite underground mines in the United States, 1963, by States [1]

State	Capacity						
	1 ton	2 tons	3 tons	4–5 tons	6–9 tons	10 tons and over	Total
NUMBER REPORTED							
Alabama	128	19	95	1,789	1,050	47	3,128
Arkansas	12	66					78
Colorado	59	2,128	180	339	15	73	2,794
Illinois	645	1,228	61	175	664	132	2,905
Indiana	30	158	399	380	240		1,207
Iowa	382	172	20				574
Kentucky	235	1,677	1,986	3,975	372	1,469	9,714
Maryland	96	100	4				200
Missouri	36						36
Montana:							
Bituminous		88	50	15			153
Lignite	3						3
Total Montana	3	88	50	15			156
New Mexico	68					94	162
Ohio	736	312	74	655	839	928	3,544
Oklahoma		4	8				12
Pennsylvania	4,304	4,746	6,545	2,322	9,607	1,882	29,406
Tennessee	206	111	18	424	16		775
Utah		21	306	1,612	1,355		3,294
Virginia	520	448	891	1,574	230	300	3,963
Washington	425			27			452
West Virginia	332	3,445	10,685	14,739	5,520	6,752	41,473
Wyoming				52			52
Total	8,217	14,723	21,322	28,078	19,908	11,677	103,925
PERCENTAGE OF TOTAL							
Alabama	4.1	.6	3.0	57.2	33.6	1.5	100.0
Arkansas	15.4	84.6					100.0
Colorado	2.1	76.2	6.5	12.1	.5	2.6	100.0
Illinois	22.2	42.3	2.1	6.0	22.9	4.5	100.0
Indiana	2.5	13.1	33.0	31.5	19.9		100.0
Iowa	66.5	30.0	3.5				100.0
Kentucky	2.4	17.3	20.5	40.9	3.8	15.1	100.0
Maryland	48.0	50.0	2.0				100.0
Missouri	100.0						100.0
Montana:							
Bituminous		57.5	32.7	9.8			100.0
Lignite	100.0						100.0
Total Montana	1.9	56.4	32.1	9.6			100.0
New Mexico	42.0					58.0	100.0
Ohio	20.7	8.8	2.1	18.5	23.7	26.2	100.0
Oklahoma		33.3	66.7				100.0
Pennsylvania	14.6	16.1	22.3	7.9	32.7	6.4	100.0
Tennessee	26.6	14.3	2.3	54.7	2.1		100.0
Utah		.6	9.3	48.9	41.2		100.0
Virginia	13.1	11.3	22.5	39.7	5.8	7.6	100.0
Washington	94.0			6.0			100.0
West Virginia	.8	8.3	25.8	35.5	13.3	16.3	100.0
Wyoming				100.0			100.0
Total	7.9	14.2	20.5	27.0	19.2	11.2	100.0

[1] See table 21 for percentage coverage.

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TABLE 23.—Rail mine car haulage at bituminous coal and lignite underground mines in the United States, 1963, by States [1]

State	Production, by size of mine car reported						
	1 ton	2 tons	3 tons	4–5 tons	6–9 tons	10 tons and over	Total
NET TONS							
Alabama	62,420	15,753	55,283	2,182,110	2,523,474	166,891	5,005,931
Arkansas	14,000	9,392					23,392
Colorado	40,160	811,449	14,796	329,898	21,980	43,009	1,261,292
Illinois	253,578	527,174	161,621	857,344	4,132,658	2,001,985	7,934,360
Indiana	19,686	110,096	699,226	517,140	1,024,852		2,371,000
Iowa	39,608	68,361	46,807				154,776
Kentucky	296,566	2,358,549	2,484,976	6,997,482	1,966,696	5,881,781	19,986,050
Maryland	59,284	21,498	30,398				111,180
Missouri	20,054						20,054
Montana:							
Bituminous		28,589	12,193	6,220			47,002
Lignite	1,193						1,193
Total Montana	1,193	28,589	12,193	6,220			48,195
New Mexico	14,680					293,371	308,051
Ohio	232,249	150,452	159,266	1,800,110	2,811,207	4,578,446	9,731,730
Oklahoma		1,940	2,668				4,608
Pennsylvania	1,324,899	1,558,292	4,275,586	3,737,540	19,890,317	6,324,583	37,111,217
Tennessee	151,072	54,784	44,584	1,559,466	48,000		1,857,906
Utah		17,937	192,100	1,448,066	1,974,596		3,632,699
Virginia	198,506	835,008	1,543,878	1,423,068	552,616	1,312,042	5,865,118
Washington	125,851			49,152			175,003
West Virginia	236,011	2,191,392	12,870,475	26,402,285	14,284,574	29,830,552	85,815,289
Wyoming				38,204			38,204
Total	3,089,817	8,760,666	22,593,857	47,348,085	49,230,970	50,432,660	181,456,055
PERCENTAGE OF TOTAL							
Alabama	1.3	.3	1.1	43.6	50.4	3.3	100.0
Arkansas	59.8	40.2					100.0
Colorado	3.2	64.3	1.2	26.2	1.7	3.4	100.0
Illinois	3.2	6.7	2.0	10.8	52.1	25.2	100.0
Indiana	.8	4.7	29.5	21.8	43.2		100.0
Iowa	25.6	44.2	30.2				100.0
Kentucky	1.5	11.8	12.4	35.0	9.9	29.4	100.0
Maryland	53.3	19.3	27.4				100.0
Missouri	100.0						100.0
Montana:							
Bituminous		60.8	26.0	13.2			100.0
Lignite	100.0						100.0
Total Montana	2.5	59.3	25.3	12.9			100.0
New Mexico	4.8					95.2	100.0
Ohio	2.4	1.6	1.6	18.5	28.9	47.0	100.0
Oklahoma		42.1	57.9				100.0
Pennsylvania	3.6	4.2	11.5	10.1	53.6	17.0	100.0
Tennessee	8.1	3.0	2.4	83.9	2.6		100.0
Utah		.5	5.3	39.9	54.3		100.0
Virginia	3.4	14.2	26.3	24.3	9.4	22.4	100.0
Washington	71.9			28.1			100.0
West Virginia	.3	2.5	15.0	30.8	16.6	34.8	100.0
Wyoming				100.0			100.0
Total	1.7	4.8	12.5	26.1	27.1	27.8	100.0

[1] See table 21 for percentage coverage.

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TABLE 24.—Rubber-tired mine cars used at bituminous coal and lignite underground mines in the United States, 1963, by States [1]

State	Capacity						
	1 ton	2 tons	3 tons	4–5 tons	6–9 tons	10 tons and over	Total
NUMBER REPORTED							
Illinois			19				19
Indiana			7				7
Kentucky	210	506	241	69	13	6	1,045
Maryland		19					19
Montana (lignite)		3					3
Ohio		7		2			9
Pennsylvania	9	33	12		2	17	73
Tennessee	4	52	1				57
Utah						2	2
Virginia	1,078	2,294	281	9			3,662
West Virginia	272	857	163	33	12		1,337
Total	1,573	3,771	724	113	27	25	6,233
PERCENTAGE OF TOTAL							
Illinois			100.0				100.0
Indiana			100.0				100.0
Kentucky	20.1	48.4	23.1	6.6	1.2	.6	100.0
Maryland		100.0					100.0
Montana (lignite)		100.0					100.0
Ohio		77.8		22.2			100.0
Pennsylvania	12.3	45.2	16.5		2.7	23.3	100.0
Tennessee	7.0	91.2	1.8				100.0
Utah						100.0	100.0
Virginia	29.4	62.7	7.7	.2			100.0
West Virginia	20.3	64.1	12.2	2.5	.9		100.0
Total	25.3	60.5	11.6	1.8	.4	.4	100.0

[1] See table 21 for percentage coverage.

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TABLE 25.—Rubber-tired mine car haulage at bituminous coal and lignite underground mines in the United States, 1963, by States [1]

State	Production, by size of mine car reported						
	1 ton	2 tons	3 tons	4–5 tons	6–9 tons	10 tons and over	Total
NET TONS							
Illinois			40,085				40,085
Indiana			26,587				26,587
Kentucky	397,664	1,420,038	926,689	432,116	37,050	44,596	3,258,153
Maryland		66,040					66,040
Montana (lignite)		1,322					1,322
Ohio		21,139					21,139
Pennsylvania	6,535	28,358	19,685		4,833	329,604	389,015
Tennessee	1,200	72,986	48,000				122,186
Utah						16,481	16,481
Virginia	1,724,981	5,710,891	1,013,032	316,439			8,765,343
West Virginia	1,412,899	1,545,661	693,179	148,862	9,336		3,809,937
Total	3,543,279	8,866,435	2,767,257	897,417	51,219	390,681	16,516,288
PERCENTAGE OF TOTAL							
Illinois			100.0				100.0
Indiana			100.0				100.0
Kentucky	12.2	43.6	28.4	13.3	1.1	1.4	100.0
Maryland		100.0					100.0
Montana (lignite)		100.0					100.0
Ohio		100.0					100.0
Pennsylvania	1.7	7.3	5.1		1.2	84.7	100.0
Tennessee	1.0	59.7	39.3				100.0
Utah						100.0	100.0
Virginia	19.7	65.2	11.5	3.6			100.0
West Virginia	37.1	40.6	18.2	3.9	.2		100.0
Total	21.5	53.7	16.7	5.4	.3	2.4	100.0

[1] See table 21 for percentage coverage.

TABLE 26.—Number and production of underground bituminous coal and lignite mines using gathering and haulage conveyors, and number and length of units in use in the United States [1]

Year	Number of mines	Production (net tons)	Number of units in use	Average length (feet)	Total length (miles)
1945	117	40,189,857	359	1,438	97.6
1946	161	46,022,710	457	1,484	128.5
1947	199	70,690,920	594	1,470	165.3
1948	270	81,821,361	755	1,460	208.8
1949	314	69,947,713	860	1,514	246.7
1950	374	92,413,644	1,013	1,538	294.9
1951	372	99,643,003	1,094	1,568	325.0
1952	358	92,168,992	1,066	1,526	308.2
1953	322	100,155,249	1,042	1,541	303.9
1954	291	83,211,284	1,081	1,626	32.9
1955	314	97,677,313	1,002	1,682	319.6
1956	314	126,717,518	1,114	1,656	349.4
1957	362	136,914,192	1,233	1,672	390.4
1958	366	115,419,740	1,235	1,711	400.3
1959	371	126,654,911	1,416	1,723	462.1
1960	396	137,053,564	1,566	1,673	499.2
1961	414	140,938,297	1,635	1,655	512.6
1962	430	153,251,478	1,786	1,659	561.2
1963	494	173,999,774	1,998	1,656	626.9

[1] Includes all gathering and haulage conveyors with capacity over 500 feet, except main-slope conveyors. Excludes lignite and Virginia semianthracite mines in 1945–49.

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TABLE 27.—Number and production of underground bituminous coal and lignite mines using gathering and haulage conveyors, and number and length of units in use in the United States, by States [1]

State	Number of mines		Production (net tons)		Number of units in use		Average length (feet)		Total length (miles)	
	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
Alabama	8	7	5,830,775	5,470,917	62	69	2,013	2,073	23.6	27.1
Colorado	6	6	1,156,592	1,352,627	22	21	1,516	1,412	6.3	5.6
Illinois	16	16	21,704,786	22,258,377	141	141	2,102	2,242	56.1	59.9
Indiana	6	6	3,423,827	3,325,843	24	28	1,574	1,218	7.2	6.5
Kentucky	46	46	19,149,313	20,444,585	198	197	1,960	1,814	73.5	67.7
Maryland	1	2	62,444	135,236	1	3	2,000	1,540	.4	.9
New Mexico	2	1	251,670	293,371	2	1	2,200	1,500	.8	.3
Ohio	12	16	5,222,112	8,035,426	49	56	1,190	1,218	11.0	12.9
Pennsylvania	72	75	20,217,879	24,889,177	360	403	1,637	1,599	111.6	122.0
Tennessee	6	5	305,647	204,449	12	7	1,700	1,333	3.9	1.8
Utah	17	19	3,458,913	3,653,148	56	51	985	1,067	10.4	10.3
Virginia	21	16	9,506,570	8,885,724	102	97	2,104	2,210	40.6	40.6
West Virginia	216	278	62,898,700	75,012,690	754	921	1,505	1,550	214.9	270.4
Wyoming	1	1	62,250	38,204	3	3	1,500	1,500	.9	.9
Total	430	494	153,251,478	173,999,774	1,786	1,998	1,659	1,656	561.2	626.9

[1] Includes all mines using belt conveyors, 500 feet long or more for transporting coal underground. Excludes main-slope conveyors.

STRIP MINING

Strip mines have two substantial advantages over underground mines: (1) The output per man per day in strip mines is more than double that in underground mines, and (2) the average value of strip coal, f.o.b. mines, is about one-third less than the average value of coal from underground mines. See figures 9 and 10.

The rapid growth of strip mining was made possible by the development of larger and improved stripping and drilling equipment and trucks.

An increase in the average capacity of trucks used in strip mines has reduced the number required. The average hauling distance from strip mines to tipples or ramps is approximately 5 miles.

The average thickness of overburden at all bituminous coal and lignite strip mines in the United States was 46 feet in 1960, the latest year for which figures are available. Several strip mines handled an average of more than 70 feet of overburden in 1960, and a few handled more than 80 feet.

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TABLE 28.—Growth of strip mining at bituminous coal and lignite mines in the United States, compared with underground and auger mining

Year	Production (thousand net tons)				Percentage of total mine by stripping	Average tons per man per day				Average value per ton f.o.b. mine				Number of strip mines	Number of power shovels and draglines
	Underground mines	Strip mines [1]	Auger mines	Total		Underground mines	Strip mines [1]	Auger mines	Total	Underground mines	Strip mines [1]	Auger mines	Total		
1914	421,423	1,281		422,704	.3	3.71	5.06		3.71	(2)	(2)		$1.17	[3] 35	48
1915	439,792	2,832		442,624	.6	3.90	5.81		3.91	$1.13	$1.18		1.13	[3] 60	87
1916	498,587	3,933		502,520	.8	3.88	6.67		3.90	1.32	1.51		1.32	[3] 79	111
1917	546,001	5,790		551,791	1.0	3.75	6.52		3.77	2.26	2.34		2.26	[3] 126	182
1918	571,098	8,288		579,386	1.4	3.76	6.81		3.78	2.58	2.54		2.58	[3] 165	276
1919	460,225	5,635		465,860	1.2	3.82	6.21		3.84	2.49	2.33		2.49	[3] 168	287
1920	559,807	8,860		568,667	1.5	3.97	7.20		4.00	3.74	4.12		3.75	[3] 174	312
1921	410,865	5,057		415,922	1.2	4.18	8.28		4.20	2.89	2.87		2.89	[3] 155	279
1922	412,059	10,209		422,268	2.4	4.24	8.09		4.28	3.02	3.07		3.02	272	379
1923	552,625	11,940		564,565	2.1	4.43	9.32		4.47	2.69	2.31		2.68	263	442
1924	470,080	13,607		483,687	2.8	4.50	9.91		4.56	2.20	2.00		2.20	234	420
1925	503,182	16,871		520,053	3.2	4.45	11.18		4.52	2.05	1.84		2.04	227	389
1926	556,444	16,923		573,367	3.0	4.42	11.13		4.50	2.07	1.89		2.06	237	410
1927	499,385	18,378		517,763	3.6	4.47	11.06		4.55	1.99	1.90		1.99	255	455
1928	480,956	19,789		500,745	4.0	4.61	13.02		4.73	1.87	1.69		1.86	250	415
1929	514,721	20,268		534,989	3.8	4.73	14.08		4.85	1.79	1.57		1.78	200	411
1930	447,684	19,842		467,526	4.3	4.93	16.21		5.06	1.71	1.54		1.70	218	341
1931	363,157	18,932		382,089	5.0	5.12	17.68		5.30	1.54	1.51		1.54	235	314
1932	290,069	19,641		309,710	6.3	4.99	16.95		5.22	1.31	1.32		1.31	255	332
1933	315,360	18,270		333,630	5.5	4.60	13.59		4.78	1.34	1.33		1.34	289	389
1934	338,578	20,790		359,368	5.8	4.23	13.28		4.40	1.76	1.49		1.75	344	458
1935	348,726	23,647		372,373	6.4	4.32	12.01		4.50	1.79	1.47		1.77	368	507
1936	410,962	28,126		439,088	6.4	4.42	13.91		4.62	1.77	1.49		1.76	381	562
1937	413,780	31,751		445,531	7.1	(2)	(2)		4.69	(2)	(2)		1.94	449	(2)
1938	318,138	30,407		348,545	8.7	4.60	15.00		4.89	(2)	(2)		1.95	465	737
1939	357,133	37,722		394,855	9.6	4.92	14.68		5.25	1.88	1.49		1.84	537	914

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1940	417,604	43,167	----------	460,771	9.4	4.86	15.63	----------	5.19	1.94	1.56	----------	1.91	638	1,071
1941	456,078	55,071	----------	514,149	10.7	4.83	15.59	----------	5.20	2.23	1.79	----------	2.19	769	1,321
1942	515,490	67,208	----------	582,663	11.5	4.74	15.62	----------	5.12	2.41	1.90	----------	2.36	834	1,438
1943	510,492	79,685	----------	590,177	13.5	4.89	15.15	----------	5.38	2.75	2.28	----------	2.69	1,004	1,839
1944	518,678	100,998	----------	619,676	16.3	5.04	15.89	----------	5.67	3.01	2.48	----------	2.92	1,240	2,312
1945	467,630	109,987	----------	577,617	19.0	5.04	15.46	----------	5.78	3.16	2.65	----------	3.06	1,370	2,439
1946	420,958	112,964	----------	533,922	21.1	5.43	15.73	----------	6.30	3.59	2.87	----------	3.44	1,445	2,744
1947	491,229	139,395	----------	630,624	22.1	5.49	15.63	----------	6.42	4.35	3.47	----------	4.16	1,750	3,254
1948	460,012	139,506	----------	599,518	23.3	5.31	15.28	----------	6.26	5.26	4.11	----------	4.99	1,971	3,712
1949	331,823	106,045	----------	437,868	24.2	5.42	15.33	----------	6.43	5.18	3.94	----------	4.88	1,761	3,676
1950	392,844	123,467	----------	516,311	23.9	5.75	15.66	----------	6.77	5.15	3.87	----------	4.84	1,870	3,877
1951	415,842	117,618	205	533,665	22.0	6.08	16.02	----------	7.04	5.21	3.88	----------	4.92	1,784	3,810
1952	356,425	106,910	1,506	466,841	23.3	6.37	16.77	20.07	7.47	5.24	3.81	$4.31	4.90	1,643	3,527
1953	349,551	105,448	2,291	457,290	23.1	7.01	17.62	25.30	8.17	5.27	3.75	4.15	4.92	1,554	3,390
1954	288,112	98,134	4,460	391,706	25.1	7.99	19.64	24.12	9.47	4.87	3.52	3.41	4.52	1,329	3,409
1955	343,465	115,093	6,075	464,633	24.8	8.28	21.12	22.22	9.84	4.86	3.48	3.60	4.50	1,617	3,265
1956	365,774	127,655	8,045	500,574	25.4	8.62	21.18	24.85	10.28	5.20	3.74	4.17	4.82	1,728	3,705
1957	360,649	124,109	7,946	492,704	25.2	8.91	21.64	26.19	10.59	5.52	3.89	4.12	5.08	1,756	3,723
1958	286,884	116,242	7,320	410,446	28.3	9.38	21.64	28.15	11.33	5.33	3.80	3.60	4.86	1,646	3,515
1959	283,434	120,953	7,641	412,028	29.4	10.08	22.65	28.77	12.22	5.23	3.76	3.83	4.77	1,594	3,417
1960	294,888	122,630	7,994	415,512	29.5	10.64	22.93	31.36	12.83	5.14	3.74	3.37	4.69	1,530	3,313
1961	272,766	121,979	8,232	402,977	30.3	11.41	25.00	30.61	13.87	5.02	3.67	3.24	4.58	1,477	3,204
1962	281,246	130,300	10,583	422,149	30.9	11.97	26.76	34.61	14.72	4.91	3.64	3.33	4.48	1,429	3,185
1963	302,256	144,141	12,531	458,928	31.4	12.78	28.69	38.87	15.83	4.82	3.57	3.25	4.39	1,431	3,254

[1] Includes power strip pits proper and excludes horse stripping operations and mines combining stripping and underground in the same operation for the period 1914–42. The years 1943–63 include data on all strip mines.

[2] Data not available.

[3] Exclusive of horse stripping operations.

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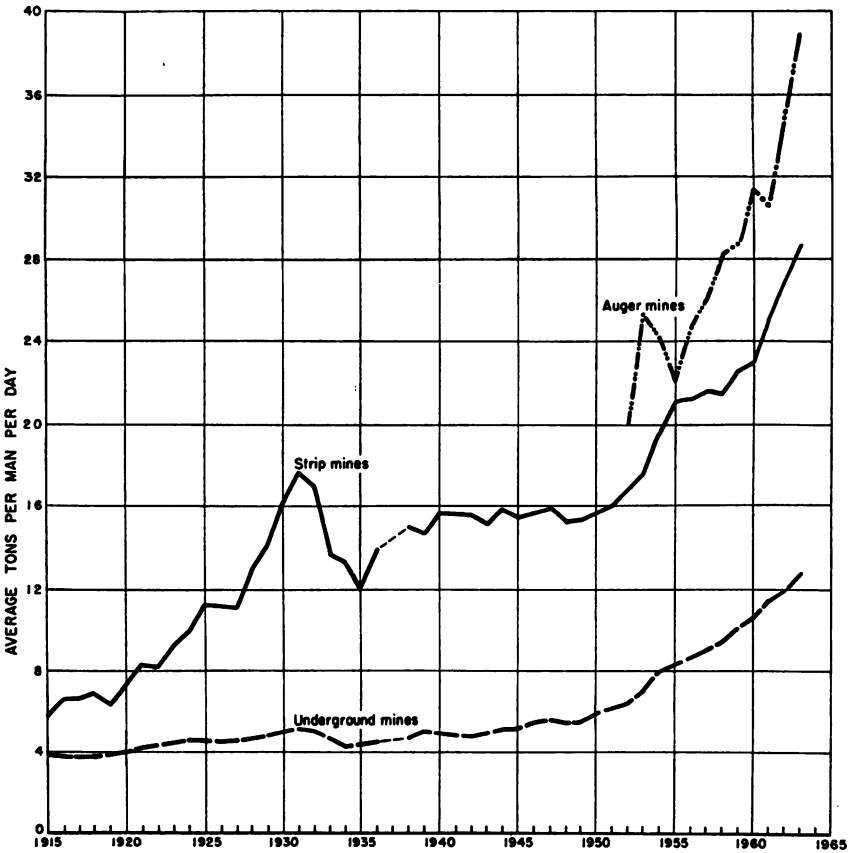

FIGURE 9.—Average tons per man per day at bituminous coal and lignite mines in the United States, 1915–63, by underground, strip, and auger mines.

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TABLE 29.—Number and production of bituminous coal and lignite strip mines and units of stripping and loading equipment in use in the United States

Year	Number of strip mines	Production (thousand net tons)	Number of power shovels and dragline excavators											Number of carry-all scrapers	Number of bull-dozers
			By type of power					By capacity of dipper or bucket, cubic yards				By type of machine		Total		
			Electric	Diesel-electric	Diesel	Gasoline	Steam	Less than 3	3–5	6–12	More than 12	Power shovels	Dragline excavators			
1932	255	19,641	[1] 105	(2)	[3] 61	(4)	166	(5)	(5)	(5)	(5)	(5)	(5)	332	(5)	(5)
1933	289	18,270	[1] 117	(2)	[3] 103	(4)	169	(5)	(5)	(5)	(5)	(5)	(5)	389	(5)	(5)
1934	344	20,790	[1] 121	(2)	[3] 149	(4)	188	(5)	(5)	(5)	(5)	(5)	(5)	458	(5)	(5)
1935	368	23,647	[1] 139	(2)	[3] 194	(4)	174	(5)	(5)	(5)	(5)	(5)	(5)	507	(5)	(5)
1936	381	28,126	[1] 151	(2)	[3] 223	(4)	188	(5)	(5)	(5)	(5)	(5)	(5)	562	(5)	(5)
1937	449	31,751	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
1938	465	30,407	[1] 155	(2)	[3] 440	(4)	142	(5)	(5)	(5)	(5)	(5)	(5)	737	(5)	(5)
1939	537	37,722	[1] 184	(2)	[3] 524	(4)	206	(5)	(5)	(5)	(5)	(5)	(5)	914	(5)	(5)
1940	638	43,167	[1] 194	(2)	[3] 697	(4)	180	(5)	(5)	(5)	(5)	(5)	(5)	1,071	(5)	(5)
1941	769	55,071	[1] 210	(2)	[3] 911	(4)	200	1,009	153	95	64	(5)	(5)	1,321	(5)	(5)
1942	834	67,203	[1] 219	(2)	[3] 1,020	(4)	199	1,114	159	97	68	(5)	(5)	1,438	(5)	(5)
1943	1,004	79,685	[1] 234	(2)	[3] 1,433	(4)	172	1,488	173	106	72	(5)	(5)	1,839	(5)	(5)
1944	1,240	100,898	[1] 244	(2)	[3] 1,902	(4)	166	1,900	225	113	74	(5)	(5)	2,312	(5)	(5)
1945	1,370	109,987	[1] 256	(2)	[3] 2,042	(4)	141	2,004	243	117	75	(5)	(5)	2,439	(5)	(5)
1946	1,445	112,964	[1] 261	(2)	1,619	753	111	2,256	302	112	74	2,406	338	2,744	263	(5)
1947	1,750	139,395	[1] 301	(2)	2,279	591	83	2,685	362	123	84	2,822	432	3,254	275	(5)
1948	1,971	139,506	[1] 337	(2)	2,675	646	54	3,048	446	130	88	3,177	535	3,712	362	(5)
1949	1,761	106,045	[1] 352	(2)	2,646	527	51	2,931	367	168	110	3,011	565	3,576	320	(5)
1950	1,870	123,467	[1] 348	(2)	2,880	607	42	3,182	416	170	109	3,247	630	3,877	286	(5)
1951	1,784	117,618	[1] 346	(2)	2,905	533	26	3,088	420	187	115	3,164	646	3,810	220	(5)
1952	1,643	108,910	[1] 321	(2)	2,642	545	19	2,800	425	183	119	2,892	635	3,527	218	(5)
1953	1,554	105,448	[1] 317	(2)	2,629	446	17	2,692	413	193	111	2,793	616	3,409	244	1,954
1954	1,329	98,134	[1] 381	(2)	2,617	374	18	2,480	579	211	120	2,605	785	3,390	269	2,599
1955	1,617	115,093	[1] 315	(2)	2,603	337	10	2,381	550	223	111	2,592	673	3,265	187	2,106
1956	1,728	127,055	285	136	2,914	365	5	2,693	634	249	129	2,899	806	3,705	226	2,381
1957	1,756	124,109	325	164	2,839	389	6	2,748	566	266	143	2,894	829	3,723	215	2,499
1958	1,646	116,242	315	273	2,607	315	5	2,507	591	275	142	2,704	811	3,515	173	2,472
1959	1,594	120,953	309	215	2,579	307	7	2,435	572	267	143	2,607	810	3,417	161	2,443
1960	1,530	122,630	311	194	2,519	285	4	2,315	588	265	145	2,521	792	3,313	163	2,345
1961	1,477	121,979	286	210	2,455	253	(6)	2,162	606	299	137	2,412	792	3,204	152	2,341
1962	1,429	130,300	296	214	2,423	252	(6)	2,111	597	335	142	2,353	832	3,185	146	2,330
1963	1,431	144,141	304	213	2,503	234	(6)	2,101	627	372	154	2,409	845	3,254	163	2,430

[1] Includes diesel-electric shovels.
[2] Included with electric shovels.
[3] Includes gasoline shovels.
[4] Included with diesel shovels.
[5] Data not available.
[6] Canvass discontinued.

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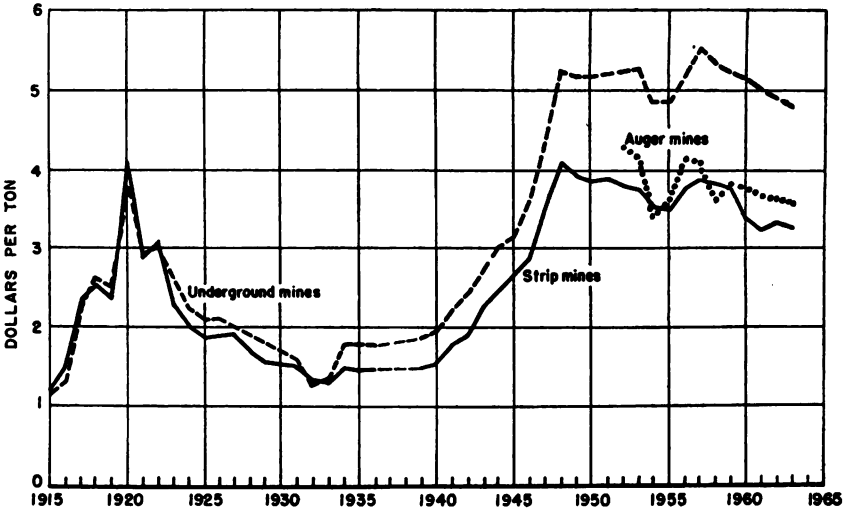

FIGURE 10.—Average value per ton, f.o.b. mines, of bituminous coal and lignite produced in the United States, 1915–63, by underground, strip, and auger mines.

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TABLE 30.—Number and production of bituminous coal and lignite strip mines and units of stripping and loading equipment in use in the United States, 1963, by States

State	Number of strip mines	Production (net tons)	Number of power shovels and dragline excavators											Number of carryall scrapers	Number of bull-dozers
			By type of power				By capacity of dipper or bucket, cubic yards				By type of machine		Total		
			Electric	Diesel electric	Diesel	Gasoline	Less than 3	3–5	6–12	More than12	Power shovels	Dragline excavators			
Alabama	46	2,792,803	5	4	73	7	61	12	12	4	72	17	89	5	66
Alaska	5	853,398			13		7	5	1		12	1	13		26
Arkansas	5	145,432		1	8		6	1	2		3	6	9		7
Colorado	8	856,583	4	2	7		4	5	3	1	7	6	13	2	17
Illinois	64	27,287,310	95	6	55	7	31	31	50	51	105	58	163	2	139
Indiana	38	10,939,483	42	7	50	10	42	27	23	17	66	43	109	4	87
Iowa	19	1,056,151	4		31	8	29	12	2		23	20	43	4	32
Kansas	9	1,166,964	8	3	6	2	8	3	4	4	12	7	19	1	8
Kentucky:															
Eastern	76	2,846,811	1	5	105	2	93	16	4		109	4	113	3	107
Western	40	22,905,411	41	10	66	2	41	31	28	19	89	30	119	1	100
Total Kentucky	116	25,752,222	42	15	171	4	134	47	32	19	198	34	232	4	207
Maryland	31	736,459		1	39	12	46	4		2	46	6	52	6	36
Missouri	18	3,136,868	11	6	17	5	22	6	4	7	24	15	39	5	39
Montana:															
Bituminous	1	3,000				1	1				1		1	2	
Lignite	1	284,364	1		1			1	1		1	1	2	1	1
Total Montana	2	287,364	1		1	1	1	1	1		2	1	3	3	1
New Mexico	3	1,631,448	4	1	2		1		4	2	5	2	7		9
North Dakota (lignite)	29	2,397,108	21	4	16	9	25	12	11	2	37	13	50	29	42
Ohio	266	24,407,420	40	35	454	67	364	136	72	24	436	160	596	46	490
Oklahoma	11	954,296	7	3	7		9	2	2	4	11	6	17		20
Pennsylvania	521	24,467,772	12	96	1,147	85	966	238	121	15	920	420	1,340	23	814
South Dakota (lignite)	1	16,561		1	1		2				1	1	2	1	1
Tennessee	58	2,490,737		3	92	2	79	11	7		88	9	97		76
Virginia	38	2,301,051		3	57	7	60	7			66	1	67		59
Washington	1	7,357				1	1				1		1		1
West Virginia	130	7,449,314	2	22	244	4	192	61	18	1	259	13	272	11	236
Wyoming	12	3,006,576	6		12	3	11	6	3	1	15	6	21	17	17
Total	1,431	144,140,677	304	213	2,503	234	2,101	627	372	154	2,409	845	3,254	163	2,430

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TABLE 31.—Bituminous coal and lignite strip mines using power drills in bank or overburden in the United States

Year	Number of mines	Production		Number of power drills		
		Quantity (net tons)	Percentage of total	Horizontal	Vertical	Total
1946	514	75,375,841	66.7	[1]	[1]	764
1947	598	95,915,346	68.8	[1]	[1]	875
1948	728	98,809,393	72.3	[1]	[1]	1,195
1949	756	78,146,655	73.7	[1]	[1]	1,256
1950	692	87,205,280	70.6	[1]	[1]	1,201
1951	650	85,331,204	72.5	737	388	1,125
1952	629	79,252,284	73.0	685	385	1,070
1953	603	80,259,365	76.1	639	409	1,048
1954	541	70,107,205	71.4	592	391	983
1955	564	85,623,050	74.4	582	371	953
1956	696	96,278,779	75.8	652	389	1,041
1957	722	96,418,089	77.7	640	464	1,104
1958	737	91,659,662	78.9	615	464	1,079
1959	697	95,716,153	79.1	580	487	1,067
1960	714	96,660,466	78.8	551	498	1,049
1961	650	92,135,940	75.5	495	449	944
1962	636	100,901,554	77.4	456	461	917
1963	613	108,424,525	75.2	414	459	873

[1] Data not available.

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TABLE 32.—Bituminous coal and lignite strip mines using power drills in bank or overburden in the United States, by States

State	Number of mines		Production				Number of power drills					
			Quantity (net tons)		Percentage of total strip production		Horizontal		Vertical		Total	
	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
Alabama	21	22	1,863,186	1,921,897	67.2	68.8	9	10	19	18	28	28
Alaska	5	5	761,566	853,398	100.0	100.0	3	3	9	5	12	8
Arkansas	6	3	164,277	124,686	98.9	85.7	5	2	1	2	6	4
Colorado	4	4	518,762	817,188	92.5	95.4	2	4	5	5	7	9
Illinois	40	37	20,565,677	21,074,807	83.7	77.2	29	28	28	25	57	53
Indiana	28	26	11,198,453	10,670,623	99.0	97.5	20	18	19	19	39	37
Iowa	22	17	965,882	1,050,612	100.0	99.5	21	17	11	13	32	30
Kansas	6	7	904,748	1,162,342	99.1	99.6	10	10	-------	3	10	13
Kentucky:												
Eastern	22	21	1,192,599	1,100,786	54.0	38.7	16	11	9	5	25	16
Western	25	22	18,542,214	19,955,852	91.6	87.1	16	12	34	33	50	45
Total Kentucky	47	43	19,734,813	21,056,638	88.0	81.8	32	23	43	38	75	61
Maryland	4	3	221,120	184,910	47.2	25.1	1	1	3	2	4	3
Missouri	11	11	2,279,778	3,072,054	80.3	97.9	13	15	1	-------	14	15
Montana:												
Bituminous	1	1	3,000	3,000	100.0	100.0	1	1	-------	-------	1	1
Lignite	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
Total Montana	1	1	3,000	3,000	100.0	100.0	1	1	-------	-------	1	1
New Mexico	1	3	395,065	1,631,448	99.3	100.0	-------	2	1	2	1	4
North Dakota (lignite)	5	5	897,925	727,796	32.9	30.4	4	3	3	4	7	7
Ohio	118	108	18,196,438	18,453,908	77.6	75.6	78	61	98	102	176	163
Oklahoma	10	11	865,941	936,341	97.4	98.1	9	6	7	6	16	12
Pennsylvania	182	189	11,753,791	13,368,578	52.9	54.6	114	116	138	129	252	245
Tennessee	23	18	1,302,986	1,066,938	57.3	42.8	21	19	9	7	30	26
Virginia	14	12	1,144,528	1,447,282	63.9	62.9	11	10	6	6	17	16
Washington	1	-------	2,115	-------	100.0	-------	-------	-------	-------	-------	-------	-------
West Virginia	79	79	4,839,610	5,861,049	79.0	78.7	67	60	51	65	118	125
Wyoming	8	9	2,321,893	2,939,030	99.2	97.8	6	5	9	8	15	13
Total	636	613	100,901,554	108,424,525	77.4	75.2	456	414	461	459	917	873

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TABLE 33.—Method of haulage from bituminous coal and lignite strip mines to tipple or ramp, in the United States [1]

Year	Strip mines reporting method of haulage							Strip mines not reporting method of haulage—production (net tons)	Total strip production (net tons)
	Strip mines using trucks				Strip mines using rail, rail and truck, truck and tram—production (net tons)	Strip production			
	Production (net tons)	Number of trucks	Average capacity per truck (net tons)	Average distance hauled (miles)		Total (net tons)	Percentage of total		
1948	97,450,399	7,214	9.4	3.7	6,327,989	103,778,388	74.4	35,727,532	139,505,920
1949	73,229,556	6,694	10.1	3.7	5,365,432	78,594,988	74.1	27,450,311	106,045,299
1950	88,666,733	6,564	10.3	3.8	4,364,333	93,031,066	75.3	30,435,498	123,466,564
1951	87,427,029	6,173	10.6	4.0	2,424,994	89,852,023	76.4	27,765,653	117,617,676
1952	88,589,637	5,799	11.3	4.0	2,296,744	90,886,381	83.5	18,023,375	108,909,756
1953	84,764,694	5,287	12.2	4.0	2,104,609	86,869,303	82.4	18,579,266	105,448,569
1954	73,794,489	4,250	13.2	3.9	1,203,753	74,998,242	76.4	23,136,008	98,134,250
1955	94,150,171	4,798	13.3	3.9	2,290,600	96,440,771	83.9	18,651,998	115,092,769
1956	103,127,374	5,432	13.3	4.4	1,056,627	104,184,001	82.0	22,871,381	127,055,382
1957	104,796,728	5,532	14.0	4.3	164,311	104,961,039	84.6	19,147,499	124,108,538
1958	99,223,676	5,151	14.5	4.4	19,241	99,242,917	85.4	16,998,870	116,241,787
1959	102,706,819	4,959	15.3	4.6	----------	102,706,819	84.9	18,246,515	120,953,334
1960	104,099,974	4,855	15.5	4.8	----------	104,099,974	84.9	18,529,690	122,629,664
1961	101,951,989	4,407	16.5	4.4	----------	101,951,989	83.6	20,027,095	121,979,084
1962	109,846,339	4,309	17.7	4.9	----------	109,846,339	84.3	20,453,885	130,300,224
1963	119,681,295	4,314	18.5	4.7	----------	119,681,295	83.0	24,459,382	144,140,677

[1] Excludes lignite in 1948 and 1949.

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TABLE 34.—Method of haulage from bituminous coal and lignite strip mines to tipple or ramp, in the United States, 1963, by States

State	Strip mines reporting method of haulage					Strip mines not reporting method of haulage-production (net tons)	Total strip production (net tons)
	Number of trucks	Average capacity per truck (net tons)	Average distance hauled (miles)	Production			
				Net tons	Percentage of total production		
Alabama	88	18.6	4.1	1,918,302	68.7	874,501	2,792,803
Alaska	14	23.9	2.4	649,453	76.1	203,945	853,398
Arkansas	12	10.4	1.4	144,332	99.2	1,100	145,432
Colorado	23	19.5	1.9	830,477	97.0	26,106	856,583
Illinois	377	33.2	3.6	27,143,800	99.5	143,510	27,287,310
Indiana	143	31.2	4.6	10,656,369	97.4	283,114	10,939,483
Iowa	48	11.0	3.6	1,035,983	98.1	20,168	1,056,151
Kansas	28	29.9	2.9	1,162,342	99.6	4,622	1,166,964
Kentucky	387	21.3	3.5	19,570,582	79.1	6,181,640	25,752,222
Maryland	16	17.9	7.2	333,049	45.2	403,410	736,459
Missouri	68	32.6	3.1	3,103,592	98.9	33,276	3,136,868
Montana:							
Bituminous	1	8.0	.3	3,000	100.0	----------	3,000
Lignite	4	20.0	1.5	284,364	100.0	----------	284,364
Total Montana	5	17.6	1.5	287,364	100.0	----------	287,364
New Mexico	18	38.1	3.1	1,631,448	100.0	----------	1,631,448
North Dakota (lignite)	85	15.2	3.1	2,352,445	98.1	44,663	2,397,108
Ohio	758	18.1	6.8	18,697,111	76.6	5,710,309	24,407,420
Oklahoma	32	19.3	7.8	874,128	91.6	80,168	954,296
Pennsylvania	1,540	13.4	5.5	18,189,135	74.3	6,278,637	24,467,772
South Dakota (lignite)	3	6.0	.8	16,561	100.0	----------	16,561
Tennessee	89	14.6	9.6	749,403	30.1	1,741,334	2,490,737
Virginia	76	13.4	4.2	1,611,804	70.0	689,247	2,301,051
Washington	2	10.0	3.0	7,357	100.0	----------	7,357
West Virginia	471	16.1	6.7	5,762,628	77.4	1,686,686	7,449,314
Wyoming	31	36.1	6.5	2,953,630	98.2	52,946	3,006,576
Total	4,314	18.5	4.7	119,681,295	83.0	24,459,382	144,140,677

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TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1963, by States and counties

State and county	Number of strip mines	Production (net tons)	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day
Alabama:						
Bibb	3	67,491	45	75	3,375	20.00
Blount	1	95,808	26	320	8,331	11.50
Cullman	2	6,500	3	129	372	17.44
Jefferson	9	375,050	105	250	26,191	14.32
Marion	4	125,671	27	276	7,485	16.79
Tuscaloosa	7	431,740	92	173	15,990	27.00
Walker	18	1,576,570	275	169	46,438	33.95
Winston	2	113,973	25	244	6,095	18.70
Total Alabama	46	2,792,803	598	191	114,277	24.44
Alaska	5	853,398	196	255	49,906	17.10
Arkansas:						
Franklin	1	80,686	17	221	3,755	21.49
Johnson	(1)	(1)	(1)	(1)	(1)	(1)
Sebastian	(1)	(1)	(1)	(1)	(1)	(1)
Other counties	4	64,746	40	168	6,731	9.62
Total Arkansas	5	145,432	57	184	10,486	13.87
Colorado:						
El Paso	(1)	(1)	(1)	(1)	(1)	(1)
Fremont	(1)	(1)	(1)	(1)	(1)	(1)
Mesa	1	5,586	2	123	247	22.62
Montrose	(1)	(1)	(1)	(1)	(1)	(1)
Routt	(1)	(1)	(1)	(1)	(1)	(1)
Other counties	7	850,997	108	212	22,857	37.23
Total Colorado	8	856,583	110	210	23,104	37.08
Illinois:						
Adams	1	33,509	16	153	2,444	13.71
Bureau	(1)	(1)	(1)	(1)	(1)	(1)
Fulton	16	6,272,588	840	253	212,486	29.52
Greene	(1)	(1)	(1)	(1)	(1)	(1)
Grundy	(1)	(1)	(1)	(1)	(1)	(1)
Jackson	(1)	(1)	(1)	(1)	(1)	(1)
Jefferson	1	7,512	4	200	751	10.00
Knox	(1)	(1)	(1)	(1)	(1)	(1)
Mercer	(1)	(1)	(1)	(1)	(1)	(1)
Peoria	5	926,352	122	270	32,943	28.12
Perry	(1)	(1)	(1)	(1)	(1)	(1)
Randolph	(1)	(1)	(1)	(1)	(1)	(1)
St. Clair	(1)	(1)	(1)	(1)	(1)	(1)
Saline	10	2,327,976	348	263	91,473	25.45
Schuyler	(1)	(1)	(1)	(1)	(1)	(1)
Stark	(1)	(1)	(1)	(1)	(1)	(1)
Vermilion	3	1,106,574	130	285	37,046	29.87
Wabash	1	3,076	2	119	238	12.92
Will	(1)	(1)	(1)	(1)	(1)	(1)
Williamson	6	2,738,044	293	282	82,596	33.15
Other counties	21	13,871,679	1,244	282	350,237	39.61
Total Illinois	64	27,287,310	2,999	270	810,214	33.68
Indiana:						
Clay	7	1,025,865	170	233	39,624	25.89
Daviess	1	32,135	16	185	2,959	10.86
Fountain	(1)	(1)	(1)	(1)	(1)	(1)
Greene	6	1,528,622	204	274	55,932	27.33
Owen	(1)	(1)	(1)	(1)	(1)	(1)
Parke	1	7,577	12	245	2,937	2.58
Pike	4	1,820,632	265	266	70,485	25.83
Spencer	4	68,730	27	152	4,143	16.59
Sullivan	1	8,264	8	133	1,005	8.22
Vigo	1	596,725	78	241	18,771	31.79
Warrick	10	5,413,511	406	262	106,502	50.83
Other counties	3	437,422	62	245	15,206	28.77
Total Indiana	38	10,939,483	1,248	254	317,564	34.45

See footnotes at end of table.

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TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1963, by States and counties—Continued

State and county	Number of strip mines	Production (net tons)	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day
Iowa:						
Mahaska	6	331,349	68	300	20,403	16.24
Marion	7	595,053	103	232	23,936	24.86
Monroe	3	43,416	11	141	1,508	28.79
Van Buren	1	18,554	9	130	1,170	15.86
Wapello	2	67,779	17	293	4,980	13.61
Total Iowa	19	1,056,151	208	250	51,997	20.31
Kansas:						
Bourbon	2	9,029	7	111	780	11.58
Cherokee	(1)	(1)	(1)	(1)	(1)	(1)
Coffey	1	1,319	2	117	234	5.64
Crawford	(1)	(1)	(1)	(1)	(1)	(1)
Other counties	6	1,156,616	222	249	55,178	20.96
Total Kansas	9	1,166,964	231	243	56,192	20.77
Kentucky, Eastern:						
Bell	21	547,042	130	169	21,987	24.88
Boyd	1	39,189	26	100	2,613	15.00
Breathitt	3	62,000	41	100	4,133	15.00
Clay	2	13,189	12	93	1,117	11.81
Harlan	6	218,930	23	255	5,876	37.26
Jackson	1	30,000	20	100	2,000	15.00
Knott	4	451,397	125	129	16,121	28.00
Knox	2	116,263	31	239	7,410	15.69
Laurel	2	67,841	30	150	4,523	15.00
Lawrence	1	24,223	7	60	420	57.67
Leslie	3	195,612	17	162	2,758	70.93
Letcher	4	60,284	49	54	2,658	22.68
Magoffin	(1)	(1)	(1)	(1)	(1)	(1)
Morgan	2	23,000	10	142	1,420	16.20
Perry	5	320,940	16	197	3,151	101.84
Pike	9	359,577	44	127	5,595	64.27
Pulaski	(1)	(1)	(1)	(1)	(1)	(1)
Rockcastle	1	1,800	4	45	180	10.00
Whitley	7	242,193	84	153	12,917	18.75
Other counties	2	73,331	10	199	1,990	36.85
Total Eastern Kentucky	76	2,846,811	679	143	96,869	29.39
Kentucky, Western:						
Butler	(1)	(1)	(1)	(1)	(1)	(1)
Christian	1	58,659	15	227	3,408	17.21
Daviess	3	797,679	74	271	20,072	39.74
Hancock	(1)	(1)	(1)	(1)	(1)	(1)
Hopkins	10	3,906,684	377	239	90,078	43.37
McLean	1	56,653	10	212	2,120	26.72
Muhlenberg	9	14,426,685	798	297	236,969	60.88
Ohio	8	2,977,313	306	252	77,132	38.60
Union	(1)	(1)	(1)	(1)	(1)	(1)
Webster	3	346,322	50	211	10,571	32.76
Other counties	5	335,416	136	68	9,292	36.10
Total Western Kentucky	40	22,905,411	1,766	255	449,642	50.94
Total Kentucky	116	25,752,222	2,445	224	546,511	47.12
Maryland:						
Allegany	20	123,761	68	142	9,707	12.75
Garrett	11	612,698	89	236	20,904	29.31
Total Maryland	31	736,459	157	195	30,611	24.06

See footnotes at end of table.

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TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1963, by States and counties—Continued

State and county	Number of strip mines	Production (net tons)	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day
Missouri:						
Boone	(1)	(1)	(1)	(1)	(1)	(1)
Callaway	1	27,856	6	313	1,875	14.86
Clark	1	8,390	5	187	932	9.00
Dade	1	19,000	10	285	2,849	6.67
Henry	5	1,285,201	130	282	36,678	35.04
Macon	(1)	(1)	(1)	(1)	(1)	(1)
Putnam	2	111,300	25	300	7,500	14.84
Randolph	1	1,250	2	75	150	8.33
St. Clair	(1)	(1)	(1)	(1)	(1)	(1)
Vernon	3	23,701	25	94	2,387	9.93
Other counties	4	1,660,170	210	270	56,752	29.25
Total Missouri	18	3,136,868	413	264	109,123	28.75
Montana (bituminous): Rosebud	(2)	(2)	(2)	(2)	(2)	(2)
Montana (lignite): Richland	(2)	(2)	(2)	(2)	(2)	(2)
Total Montana	(2)	(2)	(2)	(2)	(2)	(2)
New Mexico:						
McKinley [3]	4	718,049	66	256	16,893	42.51
San Juan	1	1,200,763	64	258	16,590	72.38
Total New Mexico [3]	5	1,918,812	130	258	33,483	57.31
North Dakota (lignite):						
Adams	1	27,236	8	255	2,040	13.35
Bowman	(1)	(1)	(1)	(1)	(1)	(1)
Burke	(1)	(1)	(1)	(1)	(1)	(1)
Burleigh	1	9,994	3	136	408	24.50
Divide	(1)	(1)	(1)	(1)	(1)	(1)
Dunn	1	3,714	3	130	390	9.52
Grant	4	19,590	7	135	937	20.91
Hettinger	1	3,487	1	160	160	21.79
McLean	3	61,299	19	146	2,771	22.12
Mercer	3	1,042,578	101	200	20,166	51.70
Morton	3	12,784	6	110	659	19.40
Oliver	2	7,623	4	82	326	23.38
Stark	(1)	(1)	(1)	(1)	(1)	(1)
Ward	(1)	(1)	(1)	(1)	(1)	(1)
Other counties	10	1,208,803	157	231	36,267	33.33
Total North Dakota (lignite)	29	2,397,108	309	208	64,124	37.38
Ohio:						
Athens	(1)	(1)	(1)	(1)	(1)	(1)
Belmont	21	1,923,009	317	245	77,572	24.79
Carroll	11	260,166	56	262	14,707	17.69
Columbiana	33	1,204,753	255	261	66,487	18.12
Coshocton	8	1,582,547	230	231	53,195	29.75
Gallia	7	491,934	116	230	26,663	18.45
Guernsey	8	329,989	68	238	16,200	20.37
Harrison	13	5,755,254	494	242	119,478	48.17
Hocking	4	68,405	27	180	4,879	14.02
Holmes	4	296,159	41	260	10,742	27.57
Jackson	12	361,458	88	267	23,410	15.44
Jefferson	33	2,739,817	509	246	125,277	21.87
Lawrence	(1)	(1)	(1)	(1)	(1)	(1)
Mahoning	16	912,578	198	258	51,153	17.84
Meigs	4	132,986	40	172	6,883	19.32
Morgan	3	2,472,287	249	251	62,495	39.56
Muskingum	5	27,935	20	132	2,676	10.44
Noble	10	1,400,127	168	219	36,729	38.12
Perry	8	1,442,904	180	289	52,109	27.69
Portage	1	79,887	22	311	6,840	11.68
Stark	19	571,792	152	229	34,717	16.47
Tuscarawas	33	1,926,566	472	262	123,656	15.58
Vinton	(1)	(1)	(1)	(1)	(1)	(1)
Washington	(1)	(1)	(1)	(1)	(1)	(1)
Wayne	2	85,483	40	273	10,903	7.84
Other counties	11	341,384	98	157	15,353	22.24
Total Ohio	266	24,407,420	3,840	245	942,124	25.91

See footnotes at end of table.

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TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, by States and counties—Continued

State and county	Number of strip mines	Production (net tons)	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day
Oklahoma:						
Craig	6	317,389	94	249	23,441	13.54
Haskell	(1)	(1)	(1)	(1)	(1)	(1)
McIntosh	1	1,313	2	96	192	6.84
Okmulgee	1	1,461	2	58	116	12.59
Rogers	(1)	(1)	(1)	(1)	(1)	(1)
Other counties	3	634,133	120	222	26,658	23.79
Total Oklahoma	11	954,296	218	231	50,407	18.93
Pennsylvania:						
Allegheny	18	753,624	121	214	25,996	28.99
Armstrong	45	1,485,446	485	146	70,904	20.95
Beaver	13	349,751	86	235	20,182	17.33
Bedford	(1)	(1)	(1)	(1)	(1)	(1)
Blair	1	7,618	3	309	927	8.22
Bradford	(1)	(1)	(1)	(1)	(1)	(1)
Butler	30	1,594,277	307	238	73,038	21.83
Cambria	18	774,970	243	198	48,105	16.11
Cameron	1	68,041	14	295	4,124	16.50
Centre	13	713,581	199	277	55,018	12.97
Clarion	32	3,550,769	652	286	186,490	19.04
Clearfield	96	5,820,818	1,424	238	338,814	17.18
Clinton	4	478,928	75	246	18,449	25.96
Elk	9	459,595	102	255	26,084	17.62
Fayette	21	425,082	1,184	174	20,605	20.63
Greene	5	56,064	23	152	3,497	16.03
Huntingdon	(1)	(1)	(1)	(1)	(1)	(1)
Indiana	33	763,772	187	197	36,826	20.74
Jefferson	27	1,234,509	351	186	65,283	18.91
Lawrence	21	870,003	164	277	45,384	19.17
Lycoming	2	27,192	10	180	1,800	15.11
McKean	(1)	(1)	(1)	(1)	(1)	(1)
Mercer	12	982,090	183	289	53,029	18.52
Somerset	49	1,826,498	398	213	84,756	21.55
Tioga	5	375,868	81	249	20,121	18.68
Venango	11	652,594	107	268	28,787	22.67
Washington	14	804,631	208	206	42,822	18.79
Westmoreland	31	200,638	98	129	12,595	15.93
Other counties	10	191,413	74	196	14,474	13.22
Total Pennsylvania	521	24,467,772	6,779	191	1,298,110	18.85
South Dakota (lignite): Dewey	1	16,561	8	183	1,460	11.34
Tennessee:						
Anderson	10	492,549	51	199	10,087	48.83
Bledsoe	1	33,043	15	120	1,800	18.36
Campbell	17	854,112	179	211	37,726	22.64
Claiborne	4	169,445	27	219	5,829	29.07
Grundy	(1)	(1)	(1)	(1)	(1)	(1)
Hamilton	(1)	(1)	(1)	(1)	(1)	(1)
Marion	3	85,617	27	174	4,648	18.42
Morgan	5	144,015	21	210	4,415	32.62
Scott	9	210,626	82	91	7,453	28.26
Sequatchie	1	59,872	14	259	3,624	16.52
Van Buren	5	201,955	104	88	9,180	22.00
Other counties	3	239,503	45	222	10,003	23.94
Total Tennessee	58	2,490,737	565	168	94,765	26.28
Virginia:						
Buchanan	8	302,189	81	192	15,529	19.46
Dickenson	9	640,152	54	222	11,995	53.37
Lee	1	5,327	2	177	355	15.00
Russell	4	22,986	12	115	1,380	16.66
Scott	1	1,563	2	75	156	10.00
Tazewell	2	98,022	21	216	4,538	21.60
Wise	13	1,230,812	142	232	32,945	37.36
Total Virginia	38	2,301,051	314	213	66,898	34.40
Washington: Kittitas	1	7,357	5	96	479	15.36

See footnotes at end of table.

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TABLE 35.—Stripping operations in the bituminous coal and lignite fields of the United States, 1963, by States and countries—Continued

State and county	Number of strip mines	Production (net tons)	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day
West Virginia:						
Barbour	14	876,328	177	180	31,948	27.43
Boone	4	498,767	106	199	21,107	23.63
Brooke	6	378,017	67	231	15,575	24.27
Fayette	3	233,877	37	233	8,614	27.15
Grant	(1)	(1)	(1)	(1)	(1)	(1)
Greenbrier	1	19,852	7	177	1,242	15.99
Harrison	21	1,127,413	260	204	53,030	21.26
Kanawha	6	624,810	75	236	17,730	35.24
Lewis	(1)	(1)	(1)	(1)	(1)	(1)
Lincoln	2	11,765	14	74	1,030	11.42
Logan	(1)	(1)	(1)	(1)	(1)	(1)
Marion	3	52,048	20	76	1,495	34.81
Mason	2	107,398	24	183	4,394	24.44
McDowell	7	560,729	101	201	20,346	27.56
Mercer	3	186,207	31	168	5,273	35.31
Mingo	1	1,545	7	5	35	44.14
Monongalia	4	103,005	16	220	3,526	29.21
Nicholas	5	256,455	62	153	9,477	27.06
Preston	17	996,820	151	269	40,703	24.49
Putnam	(1)	(1)	(1)	(1)	(1)	(1)
Raleigh	7	231,940	42	215	9,011	25.74
Randolph	5	120,470	43	170	7,244	16.63
Taylor	4	222,489	34	75	2,566	86.72
Tucker	2	85,238	21	105	2,209	38.59
Upshur	3	64,092	18	99	1,766	36.30
Webster	3	65,330	56	206	11,625	5.62
Wyoming	(1)	(1)	(1)	(1)	(1)	(1)
Other counties	7	624,719	131	217	28,405	21.99
Total West Virginia	130	7,449,314	1,500	199	298,351	24.97
Wyoming:						
Campbell	1	495,886	34	262	8,914	55.63
Carbon	4	531,021	87	158	13,711	38.73
Converse	(1)	(1)	(1)	(1)	(1)	(1)
Lincoln	(1)	(1)	(1)	(1)	(1)	(1)
Sheridan	2	375,823	36	237	8,541	44.00
Other counties	5	1,603,846	101	218	22,026	72.82
Total Wyoming	12	3,006,576	258	206	53,192	56.52
Total United States	1,431	144,140,677	22,588	222	5,023,378	28.69

[1] Included in "Other counties" to avoid disclosing individual operations.
[2] To avoid disclosing individual operations Montana and McKinley County, New Mexico, are combined.

AUGER MINING

Augers are generally used in areas where strip mining has become economically impracticable because the overburden is thick. They were used first about 1945, and separate statistics on coal-recovery augers begin with 1951. The rapidly expanded production of coal by stripping during World War II in the mountainous areas of the northern Appalachian region left many miles of high wall containing exposed coal seams. After several years of experimentation, large, efficient augers as much as 84 inches in diameter were developed to recover the coal from these exposed coal seams.

Production at auger mines increased rapidly from 205,000 tons in 1951 to 13 million tons in 1963. Augers were used to mine coal in eight States in 1963, and sales of augers reported by three manufacturers indicate continued growth of auger mining. A few coal-recovery augers have been sold for underground use; these units and the coal produced by them have been included with coal loaded mechanically underground.

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TABLE 36.—Auger mines in the bituminous coal and lignite fields of the United States, 1963, by States and counties

State and county	Number of auger mines	Equipment in use (number of units)				Production (net tons)	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day
		Augers	Power shovels	Power drills	Bull-dozers					
Alabama:										
Jefferson	1	1				4,600	3	75	230	20.00
Walker	4	6		4	1	96,039	17	215	3,697	25.98
Total Alabama	5	7		4	1	100,639	20	196	3,927	25.63
Kentucky, Eastern:										
Bell	5	5			1	209,904	15	195	2,931	71.62
Breathitt	1	1			1	7,063	9	52	471	15.00
Clay	1	1			1	53,209	12	148	1,774	30.00
Floyd	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Harlan	6	7	1	2	8	187,054	20	176	3,533	52.95
Jackson	1	1				10,000	5	100	500	20.00
Knott	8	8			9	428,159	470	55	25,839	16.57
Knox	1	2				67,952	4	202	808	84.10
Laurel	1	1				80,658	40	100	4,033	20.00
Leslie	2	2			2	280,393	42	178	7,485	37.46
Letcher	14	14		1	13	354,788	70	111	7,774	45.64
Perry	11	12	3		16	932,239	160	153	24,539	37.99
Pike	39	38	1	2	12	1,080,350	104	143	14,885	72.58
Pulaski	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Whitley	3	3		1	2	170,307	14	188	2,639	64.54
Other counties	4	6	1		8	113,638	33	118	3,910	29.06
Total Eastern Kentucky	97	101	6	6	73	3,975,714	998	101	101,121	39.32
Kentucky, Western:										
Hopkins	1	1				41,319	22	76	1,642	25.17
Ohio	1	1		1		102,988	11	222	2,442	42.17
Total Western Kentucky	2	2		1		144,307	33	124	4,084	35.33
Total Kentucky	99	103	6	7	73	4,120,021	1,031	102	105,205	39.16

See footnotes at end of table.

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TABLE 36.—Auger mines in the bituminous coal and lignite fields of the United States, 1963, by States and counties—Continued

State and county	Number of auger mines	Equipment in use (number of units)				Production (net tons)	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per-day
		Augers	Power shovels	Power drills	Bull-dozers					
Missouri: Putnam	1	1				7,000	2	200	400	17.50
Ohio:										
Athens	1	1			1	3,893	3	74	222	17.54
Belmont	7	7			3	111,881	35	76	2,694	41.53
Columbiana	7	6			5	83,108	15	134	1,988	41.81
Coshocton	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Gallia	2	2			1	75,473	4	306	1,303	57.93
Guernsey	1	1				25,950	2	100	200	129.76
Harrison	7	6			5	72,210	9	98	911	79.28
Hocking	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Jefferson	13	14			5	370,453	51	124	6,346	58.38
Meigs	4	4		1	4	157,230	24	164	3,995	39.36
Noble	6	8			4	351,384	66	137	8,996	39.06
Perry	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Tuscarawas	7	7			4	111,189	21	122	2,568	43.30
Washington	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Other counties	7	7	1		6	531,051	54	199	10,719	49.54
Total Ohio	62	63	1	1	38	1,893,822	284	141	39,942	47.41
Pennsylvania:										
Allegheny	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Armstrong	13	13				146,238	74	124	9,226	15.85
Beaver	5	6			1	98,008	34	117	3,958	24.76
Butler	9	13			1	152,887	31	144	4,464	34.25
Cambria	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Centre	1	1				9,209	10	114	1,140	8.08
Clarion	3	3			2	35,922	10	146	1,457	24.65
Clearfield	8	9				145,417	26	189	4,972	29.25
Elk	5	6		1	2	88,918	14	269	3,769	23.59
Fayette	1	1				1,290	3	78	234	5.51
Indiana	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Jefferson	10	13			1	66,819	28	92	2,578	25.92
Lawrence	1	1			1	20,220	3	210	630	32.10
Somerset	2	2				5,767	2	133	266	21.67
Venango	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Washington	3	3				88,874	13	162	2,185	40.68
Westmoreland	1	1				1,032	1	60	60	17.20
Other counties	7	7				70,150	37	90	3,340	21.00

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Total Pennsylvania	69	79	----	1	8	930,751	286	134	38,279	24.31
Tennessee:										
Anderson	2	2	----	----	1	135,192	10	216	2,067	65.39
Campbell	3	3	----	----	1	43,530	17	100	1,681	25.89
Claiborne	2	2	1	----	1	57,125	10	180	1,714	33.33
Scott	1	1	----	----	----	15,000	2	178	355	42.25
Total Tennessee	8	8	1	----	3	250,847	39	149	5,817	43.12
Virginia:										
Buchanan	19	20	----	1	7	488,912	50	193	9,662	50.60
Dickenson	8	9	----	----	3	304,441	43	183	7,863	38.72
Lee	3	3	----	----	2	36,962	15	99	1,478	25.00
Russell	3	3	----	----	----	17,376	9	106	958	18.13
Tazewell	3	3	----	----	1	144,415	10	224	2,240	64.47
Wise	15	16	----	----	8	444,808	62	199	12,339	36.05
Total Virginia	51	54	----	1	21	1,436,914	189	183	34,540	41.60
West Virginia:										
Barbour	2	2	----	----	1	61,773	7	179	1,252	49.35
Boone	8	9	4	----	9	652,709	99	168	16,621	39.27
Brooke	2	2	----	----	1	28,334	7	69	480	59.03
Fayette	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Gilmer	1	1	----	----	1	49,834	8	193	1,544	32.28
Harrison	9	10	----	----	10	322,853	45	103	4,687	68.88
Kanawha	9	13	4	----	14	1,148,067	131	212	27,771	41.34
Lewis	2	2	----	----	2	26,355	10	90	900	29.28
Logan	8	8	----	----	8	299,079	71	68	4,832	61.89
Mason	1	1	----	----	----	6,543	2	133	266	24.61
McDowell	9	12	----	----	3	217,556	36	135	4,829	45.05
Mercer	8	8	----	----	3	74,272	22	122	2,688	27.63
Mingo	5	6	1	----	7	240,923	37	137	5,026	47.94
Nicholas	6	7	1	2	5	179,751	25	141	3,463	51.91
Pocahontas	1	1	----	----	1	1,083	4	25	100	10.83
Preston	3	3	----	1	3	21,701	10	121	1,212	17.91
Raleigh	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Taylor	2	2	----	----	1	35,500	8	105	838	42.36
Wyoming	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Other counties	9	12	1	----	9	424,771	95	187	17,742	23.94
Total West Virginia	85	99	11	3	78	3,791,104	617	153	94,251	40.22
Total United States	380	414	19	17	222	12,531,098	2,468	131	322,361	38.87

[1] Included in "Other counties" to avoid disclosing individual operations.

747-148—64——8

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TABLE 37.—Units of coal-recovery augers sold to bituminous coal and lignite mines for surface use in the United States, as reported by manufacturers, by States

	1959	1960	1961	1962	1963
Alabama	1		1	1	
Illinois	1				
Iowa				1	
Kentucky	21	8	5	4	16
Ohio	7	5	5	2	4
Pennsylvania	7	7	4	4	6
Tennessee	2	1	1		
Virginia	1	1		1	1
West Virginia	7	3	2	2	9
Total	47	25	18	15	36

MECHANICAL LOADING

Prior to 1925 less than 1 percent of the total underground output was mechanically loaded. During the following 10 years (1925–35), as better machines were developed, mechanical loading increased more than 1 percent per year, and in 1935 almost 14 percent of the total underground output was mechanically loaded. Development was rapid in some States and practically nothing in others. The percentage of underground production mechanically loaded in 1935 in certain States was as follows: Wyoming (90), Illinois (56), Indiana (64), Pennsylvania (7), West Virginia (2), and Kentucky (1). During the next 20 years (1935–55), mechanical loading increased rapidly, averaging a gain of more than 3 percent per year until it included 85 percent of the underground output in 1955.

Although the increase in mechanical loading has leveled off in the past few years, the type of loading equipment has changed consider-

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ably. In the past 10 years, the proportion produced by mobile loading into mine cars decreased from 24 to 2 percent of the total mechanically loaded, and mobile loading into shuttle cars increased from 53 percent in 1953 to 65 percent in 1956, then it decreased to 55 percent in 1963; production from continuous-mining machines increased from 4 to 40 percent, and all other types of mechanical loading decreased from 16 to 3 percent.

The most important change in mechanical loading in recent years was the introduction of continuous-mining machines. In 1963, 104 million tons of bituminous coal was produced at 342 mines by continuous-mining machines, whereas in 1962, 90 million tons were produced at 297 mines. In 1963, 193 mines, compared with 150 mines in 1962, used continuous-mining machines exclusively.

Longwall mining began in November 1951, on a 340-foot face in the Pocahontas No. 4 seam in Raleigh County, West Virginia. At the Coal Show of the American Mining Congress in Cleveland in May 1964, a great deal of interest was stimulated concerning longwall mining. Four large U.S. manufacturers of underground coal mining equipment either exhibited their own make or were prepared to deliver imports of longwall mining equipment. Two other corporations exhibited foreign made longwall mining equipment. Production from longwall mining to date has not been large and as a result separate figures have not been published. However, a special survey revealed that in 1963, longwall mining was practiced in four States (Illinois, Oklahoma, Utah, and West Virginia), and a total of 816,003 tons was mined by this method.

Sales of mobile loading machines, continuous-mining machines, and bridge conveyors decreased, whereas sales of shuttle cars, gathering and haulage conveyors, and room or transfer conveyors increased.

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TABLE 38.—Growth of mechanical loading at underground bituminous coal and lignite mines in the United States

Year	Underground production (thousand net tons)							Percentage of underground production		Number of mechanical loading units				
	Mechanically loaded					Hand-loaded into mine cars	Total	Mechanically loaded	Hand-loaded into mine cars	Mobile loading machines used in conventional mining	Duckbills and scrapers [1]	Hand-loaded conveyors and pit-car loaders [1]	Continuous mining machines	Mobile loading machines used in conjunction with continuous mining
	Conventional mining			Continuous mining	Total									
	Mobile loading machines	Duckbills and scrapers [1]	Hand-loaded conveyors and pit-car loaders [1]											
1923	(2)	(2)	(2)		[3] 1,880	550,745	552,625	3.3	99.7	(2)	(2)	(2)		
1924	(2)	(2)	(2)		[3] 3,496	466,584	470,080	.7	99.3	(2)	(2)	(2)		
1925	(2)	(2)	(2)		[3] 6,243	496,939	503,182	1.2	98.8	(2)	(2)	(2)		
1926	7,786	2,236	523		[3] 10,545	545,899	556,444	1.9	98.1	295	160	(2)		
1927	(2)	(2)	(2)		16,500	482,885	499,385	3.3	96.7	(2)	(2)	(2)		
1928	11,811	2,748	7,000		21,559	459,397	480,956	4.5	95.5	397	212	1,040		
1929	16,432	2,859	18,571		37,862	476,859	514,721	7.4	92.6	488	225	2,521		
1930	20,073	3,265	23,644		46,982	400,702	447,684	10.5	89.5	545	290	2,876		
1931	19,407	3,282	24,873		47,562	315,595	363,157	13.1	86.9	583	311	3,428		
1932	14,825	2,762	18,230		35,817	254,252	290,069	12.3	87.7	548	287	3,112		
1933	17,865	2,647	17,309		37,821	277,539	315,360	12.0	88.0	523	225	2,978		
1934	20,750	3,086	17,597		41,433	297,145	338,578	12.2	87.8	534	276	2,862		
1935	24,675	3,713	18,789		47,177	301,549	348,726	13.5	86.5	657	257	2,768		
1936	40,970	4,513	21,494		66,977	343,985	410,962	16.3	83.7	980	340	2,787		
1937	(2)	(2)	(2)		83,500	330,280	413,780	20.2	79.8	(2)	(2)	(2)		
1938	57,824	5,279	21,990		85,093	233,045	318,138	26.7	73.3	1,405	463	2,918		
1939	76,442	7,766	26,504		110,712	246,421	357,133	31.0	69.0	1,573	690	2,707		
1940	100,962	11,617	35,291		147,870	269,734	417,604	35.4	64.6	1,720	772	2,960		
1941	126,478	16,208	43,981		186,667	272,411	459,078	40.7	59.3	1,985	897	3,414		
1942	160,301	22,088	50,514		232,903	282,587	515,490	45.2	54.8	2,301	1,155	3,522		
1943	179,008	24,266	46,531		249,805	260,687	510,492	48.9	51.1	2,525	1,309	3,512		
1944	202,875	24,505	46,809		274,189	244,489	518,678	52.9	47.1	2,737	1,418	3,477		
1945	198,668	22,758	41,086		262,512	205,118	467,630	56.1	43.9	2,950	1,470	3,527		
1946	186,975	20,595	37,771		245,341	175,617	420,958	58.3	41.7	3,200	1,596	3,563		
1947	229,836	22,775	45,546		298,157	193,072	491,229	60.7	39.3	3,569	1,598	4,050		
1948	232,217	20,377	42,762	450	295,806	164,206	460,012	64.3	35.7	[4] 3,965	1,688	4,162	15	(2)
1949	174,639	14,333	30,804	2,600	222,376	109,447	331,823	67.0	33.0	[4] 4,155	1,529	4,329	50	(2)

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1950	218,126	14,303	35,446	4,850	272,725	120,119	392,844	69.4	30.6	[4] 4,228	1,368	4,446	90 (2)
1951	246,397	14,010	37,683	6,061	304,051	111,791	415,842	73.1	26.9	[4] 4,302	1,264	3,904	108 (2)
1952	218,982	10,667	31,130	8,215	268,994	87,431	356,425	75.5	24.5	[4] 4,083	1,068	3,569	152 (2)
1953	232,585	8,770	25,144	11,830	278,329	71,222	349,551	79.6	20.4	[4] 3,985	878	2,994	219 (2)
1954	206,546	5,083	15,005	16,336	242,970	46,142	289,112	84.0	16.0	[4] 4,224	681	2,162	325 90
1955	243,204	4,510	15,497	27,460	290,671	52,794	343,465	84.6	15.4	[5] 3,679	510	1,925	385 140
1956	248,341	3,883	15,271	39,907	307,402	58,372	365,774	84.0	16.0	[5] 3,666	472	1,819	510 188
1957	236,720	2,781	12,453	53,783	305,737	54,912	360,649	84.8	15.2	[5] 3,556	375	1,528	614 199
1958	178,014	1,560	7,626	56,373	243,573	43,311	286,884	84.9	15.1	[5] 3,212	249	1,220	679 222
1959	171,150	1,010	5,779	65,792	243,731	39,703	283,434	86.0	14.0	[5] 2,895	144	1,014	776 226
1960	162,109	1,232	4,517	77,928	245,786	39,102	284,888	86.3	13.7	[5] 2,707	159	931	879 245
1961	145,134	1,032	4,863	84,321	235,350	37,416	272,766	86.3	13.7	[5] 2,348	130	867	927 235
1962	145,962	458	4,296	90,174	240,920	40,346	281,266	85.7	14.3	[5] 2,235	100	825	961 267
1963	150,303	457	4,131	104,350	259,241	43,015	302,256	85.8	14.2	[5] 2,186	81	680	1,030 249

[1] For separate data by type of loading, see Minerals Yearbook 1959, v. 2, p. 86. Canvass of pit-car loaders discontinued in 1951.
[2] Data not available.
[3] Exclusive of tonnage "Handled by conveyors."
[4] Includes mobile loading machines used in conjunction with continuous mining.
[5] Mobile loading machines used in conjunction with continuous mining shown separately in last column of this table.

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TABLE 39.—Bituminous coal and lignite mechanically loaded underground in the United States, by type of loading equipment

Type of loading equipment	1962		1963	
	Net tons	Percentage of total	Net tons	Percentage of total
Mobile machines:				
Direct into mine cars	5,864,992	2.4	5,813,032	2.2
Onto conveyors	4,358,543	1.8	1,926,174	.7
Into shuttle cars	135,738,574	56.4	142,563,644	55.0
Continuous-mining machines:				
Onto conveyors	10,690,077	4.4	19,897,393	7.7
Into shuttle cars	79,484,252	33.0	84,452,963	32.6
Scrapers and conveyors equipped with duckbills or other self-loading heads	488,157	.2	457,083	.2
Hand-loaded conveyors	4,295,872	1.8	4,130,546	1.6
Total mechanically loaded	240,920,467	100.0	259,240,835	100.0

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TABLE 40.—Comparative changes in underground mechanical loading of bituminous coal and lignite by principal types of loading devices in the United States, by States

State	Loading machines [1] (net tons)		Continuous-mining machines (net tons)		Hand-loaded conveyors (net tons)		Total mechanically loaded (net tons)		Total production at mines using mechanical loading devices (net tons)		Handled by each class (percent)					
											Loading machines [1]		Continuous-mining machines		Hand-loaded conveyors	
	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
Alabama	8,758,483	8,394,704	273,653	163,446	307,745	291,013	9,339,881	8,849,163	9,339,881	8,849,163	93.8	94.9	2.9	1.8	3.3	3.3
Alaska	109,813						109,813		109,813		100.0					
Arkansas					89,612	75,218	89,612	75,218	89,612	75,218					100.0	100.0
Colorado	1,194,279	1,099,281	1,340,422	1,533,734	210,873	151,649	2,745,574	2,784,664	2,769,661	2,797,904	43.5	39.5	48.8	55.1	7.7	5.4
Illinois	15,674,879	15,624,088	8,195,551	8,793,343			23,870,430	24,417,431	23,870,430	24,417,431	65.7	64.0	34.3	36.0		
Indiana	3,482,166	3,639,838	849,122	484,276			4,331,288	4,124,114	4,331,288	4,124,114	80.4	88.3	19.6	11.7		
Iowa	96,541	99,661					96,541	99,661	96,541	99,661	100.0	100.0				
Kentucky	26,770,557	27,779,913	3,449,398	4,344,908	202,217	253,416	30,422,172	32,378,237	30,649,732	32,577,181	88.0	85.8	11.3	13.4	.7	.8
Maryland		63,427	62,444	71,809	89,759	33,303	152,203	168,539	160,859	179,434		37.6	41.0	42.6	59.0	19.8
Montana	68,692	47,410			2,395	1,488	71,087	48,898	71,087	48,898	96.6	97.0			3.4	3.0
New Mexico			251,670	293,371	1,114	2,052	252,784	295,423	254,853	295,423			99.6	99.3	.4	.7
Ohio	5,074,674	5,783,286	3,576,252	4,059,193	27,937	80,791	8,678,863	9,923,270	8,689,259	9,925,684	58.5	58.3	41.2	40.9	.3	.8
Oklahoma			72,414	42,126	83,831	8,566	156,245	50,692	156,245	50,692			46.3	83.1	53.7	16.9
Pennsylvania	10,089,318	10,620,143	29,881,295	32,785,676	930,722	1,005,223	40,901,335	44,411,042	41,040,688	44,549,379	24.7	23.9	73.0	73.8	2.3	2.3
Tennessee	1,768,831	1,851,560	282,452	312,115	158,974	158,094	2,210,257	2,321,769	2,210,257	2,339,269	80.0	79.8	12.8	13.4	7.2	6.8
Utah	2,515,560	2,190,904	1,779,520	2,166,236			4,295,080	4,357,140	4,295,080	4,357,140	58.6	50.3	41.4	49.7		
Virginia	10,938,020	10,861,818	1,723,247	2,188,025	246,148	172,229	12,907,415	13,222,072	13,066,582	13,473,874	84.7	82.2	13.4	16.5	1.9	1.3
Washington	42,044	51,634	104,048	97,967	82,915	33,267	229,007	182,868	229,007	182,868	18.4	28.2	45.4	53.6	36.2	18.2
West Virginia	59,702,598	62,563,665	38,315,660	47,014,131	1,815,877	1,835,309	99,834,135	111,413,105	100,044,780	111,814,895	59.8	56.2	38.4	42.2	1.8	1.6
Wyoming	163,811	88,601	17,181		45,753	28,928	226,745	117,529	226,745	117,529	72.2	75.4	7.6		20.2	24.6
Total	146,450,266	150,759,933	90,174,329	104,350,356	4,295,872	4,130,546	240,920,467	259,240,835	241,702,400	260,275,757	60.8	58.1	37.4	40.3	1.8	1.6

[1] Includes mobile loading machines, scrapers, and conveyors equipped with duckbills or other self-loading heads.

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TABLE 41.—Number of bituminous coal and lignite underground mines using mechanical loading devices and number of units in use in the United States, by States

State	Number of mines										Number of loading devices							
	Using loading machines only [1]		Using continuous mining machines only		Using hand-loaded conveyors only		Using more than one type of mechanical loading		Total		Loading machines				Continuous mining machines		Hand-loaded conveyors (number of units)	
											Mobile [2]		Scrapers and duckbills or other self-loading conveyors					
	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
Alabama	17	14			9	9	2	2	28	25	103	83	4	4	3	2	45	56
Alaska	1								1		7							
Arkansas					9	6			9	6							17	16
Colorado	37	35	7	7	17	9	3	7	64	58	68	68	22	19	24	26	45	34
Illinois	33	32	4	4			4	3	41	39	104	96	5	5	43	41		
Indiana	13	16	1				3	2	17	18	61	60			11	9		
Iowa	2	2							2	2	4	3						
Kentucky	174	179	8	8	10	18	12	15	204	220	423	411		4	49	53	33	40
Maryland		1	1	1	7	3			8	5		2			1	1	16	6
Montana	11	9			1	1			12	10	13	9	8	9			1	1
New Mexico			2	1	2	1			4	2	5	4			5	4	1	1
Ohio	20	18	3	4	7	7	3	4	33	33	88	73			37	41	12	15
Oklahoma				1	4	2	1		5	3					1	1	77	2
Pennsylvania	68	60	46	65	93	89	29	20	236	234	338	277	27	13	355	337	235	196
Tennessee	19	17	3	4	20	18		1	42	40	31	32	12		4	7	31	25
Utah	27	24	3	4			7	7	37	35	119	100	3	3	32	37		
Virginia	67	79		6	8	4	9	8	84	97	146	149		1	10	23	26	20
Washington	4	3			2	2	1	1	7	6	4	3			3	3	17	16
West Virginia	254	290	71	88	73	74	79	88	477	540	974	1,062	5	8	381	445	246	229
Wyoming	4	3	1		1	1	1	1	7	5	14	3	14	15	2		23	23
Total	751	782	150	193	263	244	154	159	1,318	1,378	2,502	2,435	100	81	961	1,030	825	680

[1] Includes mobile loading machines, scrapers, and conveyors equipped with duckbills or other self-loading heads.
[2] Includes mobile loading machines used in conjunction with continuous mining.

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TABLE 42.—Production at bituminous coal and lignite underground mines in the United States, by States and methods of loading

State	Hand loaded (net tons)		Mechanically loaded (net tons)		Total underground production (net tons)		Underground output hand loaded (percent)		Underground output mechanically loaded (percent)	
	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
Alabama	650,197	616,357	9,339,881	8,849,163	9,990,078	9,465,520	6.5	6.5	93.5	93.5
Alaska			109,813		109,813				100.0	
Arkansas			89,612	75,218	89,612	75,218			100.0	100.0
Colorado	73,243	49,265	2,745,574	2,784,664	2,818,817	2,833,929	2.6	1.7	97.4	98.3
Georgia	7,830	4,550			7,830	4,550	100.0	100.0		
Illinois	31,881	31,575	23,870,430	24,417,431	23,902,311	24,449,006	.1	.1	99.9	99.9
Indiana	68,683	36,082	4,331,288	4,124,114	4,399,971	4,160,196	1.6	.9	98.4	99.1
Iowa	67,141	57,177	96,541	99,661	163,682	156,838	41.0	36.5	59.0	63.5
Kansas	2,189	1,715			2,189	1,715	100.0	100.0		
Kentucky	12,445,919	15,099,971	30,422,172	32,378,237	42,868,091	47,478,208	29.0	31.8	71.0	68.2
Maryland	199,813	256,970	152,203	168,539	352,016	425,509	56.8	60.4	43.2	39.6
Missouri	56,419	30,634			56,419	30,634	100.0	100.0		
Montana:										
Bituminous	4,894	2,890	69,769	47,576	74,663	50,466	6.6	5.7	93.4	94.3
Lignite	6,712	3,846	1,318	1,322	8,030	5,168	83.6	74.4	16.4	25.6
Total Montana	11,606	6,736	71,087	48,898	82,693	55,634	14.0	12.1	86.0	87.9
New Mexico	26,458	17,979	252,784	295,423	279,242	313,402	9.5	5.7	90.5	94.3
North Dakota (lignite)	2,059	1,880			2,059	1,880	100.0	100.0		
Ohio	655,135	565,318	8,678,863	9,923,270	9,333,998	10,488,588	7.0	5.4	93.0	94.6
Oklahoma	2,660	2,668	156,245	50,692	158,905	53,360	1.7	5.0	98.3	95.0
Pennsylvania	1,579,378	1,691,388	40,9 1,335	44,411,042	42,480,713	46,102,430	3.7	3.7	96.3	96.3
Tennessee	1,510,461	1,057,711	2,210,257	2,321,769	3,720,718	3,379,480	40.6	31.3	59.4	68.7
Utah	1,940	2,391	4,295,080	4,357,140	4,297,020	4,359,531	.1	.1	99.9	99.9
Virginia	13,820,795	13,570,958	12,907,415	13,222,072	26,728,210	26,793,030	51.7	50.7	48.3	49.3
Washington	3,835		229,007	182,868	232,842	182,868	1.6		98.4	100.0
West Virginia	9,126,113	9,914,240	99,834,135	111,413,105	108,960,248	121,327,345	8.4	8.2	91.6	91.8
Wyoming	2,146		226,745	117,529	228,891	117,529	.9		99.1	100.0
Total	40,345,901	43,015,565	240,920,467	259,240,835	281,266,368	302,256,400	14.3	14.2	85.7	85.8

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TABLE 43.—Units of mechanical loading equipment sold to bituminous coal and lignite mines for underground use in the United States, as reported by manufacturers

Type of equipment	1959	1960	1961	1962	1963	Change from 1962 (percent)
Mobile loading machines	95	110	84	113	89	−21.2
Continuous mining machines	140	128	115	149	137	−8.1
Conveyors [1]	65	47	66	58	81	+39.7
Number of manufacturers reporting	17	18	15	15	15	

[1] Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads.

TABLE 44.—Units of mechanical loading equipment sold for use in bituminous coal and lignite mines in the United States, as reported by manufacturers, by States

State	Mobile loading machines		Continuous mining machines		Room conveyors [1]	
	1962	1963	1962	1963	1962	1963
Alabama	10	8	1			
Colorado		1				
Illinois	5	3	7	3		1
Indiana	1			1		
Kentucky	42	24	17	11	5	3
Ohio	5		3	4		1
Oklahoma					1	
Pennsylvania	15	9	56	32	28	26
Tennessee	1	3	2	4	3	3
Utah			5	2		
Virginia	2	5	3	12		11
West Virginia	32	36	55	68	21	36
Total	113	89	149	137	58	81

[1] Includes hand-loaded conveyors and those equipped with duckbills or other self-loading heads.

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TABLE 45.—Units of conveying equipment sold for use in bituminous coal and lignite mines in the United States, as reported by manufacturers, by States

State	Bridge conveyors		Shuttle cars		Gathering and haulage conveyors [1]	
	1962	1963	1962	1963	1962	1963
Alabama	1		7	12	6	2
Colorado				1	1	2
Illinois			5	8	10	5
Indiana					10	3
Kentucky	7	5	38	41	14	22
New Mexico					1	
Ohio		1	11		4	3
Oklahoma	1					
Pennsylvania	16	18	60	28	63	48
Tennessee	2	5		4	1	4
Utah			1	3	1	1
Virginia	1	9	6		12	9
West Virginia	33	16	58	99	48	100
Total	61	54	186	196	171	199

[1] Includes all gathering and haulage conveyors with a capacity over 500 feet, except main-slope conveyors.

MECHANICAL CLEANING

Mechanical cleaning means cleaning raw coal with mechanical devices that separate out impurities, usually by differences in specific gravity, and does not include coal that is only screened. Mechanical devices are divided into two general classes—wet and pneumatic. About 93 percent of the coal cleaned in 1963 was cleaned by wet methods.

All coal mechanically cleaned in 1963 has been classified into seven types. The percentage of total production cleaned was as follows: Jigs (49), dense-medium processes (26), concentrating tables (13), pneumatic cleaning (7), classifiers, launders, and flotation each about 2 percent. Magnetite and sand were most commonly used as mediums in cleaning bituminous coal by the dense-medium processes. Magnetite was used in cleaning 44 million tons, and sand was used in cleaning 29 million tons.

Although mechanical cleaning by froth flotation has been in use at bituminous coal mines in the United States since 1930, it was not until 1960 that the tonnage cleaned by this method was large enough to be listed separately. Bituminous coal cleaned by froth flotation increased from 1,826,000 tons in 1960 to 4,539,000 tons in 1963.

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TABLE 46.—Growth of mechanical cleaning at bituminous coal and lignite mines in the United States

Year	Total production (thousand tons)	Mechanical cleaning					Percentage of total production mechanically cleaned
		Number of cleaning plants	Raw coal (thousand tons)	Cleaned coal (thousand tons)	Refuse (thousand tons)	Percentage of refuse to raw coal	
1927	517,763	(1)	(1)	27,692	(1)	(1)	5.3
1928	500,745	236	(1)	28,783	(1)	(1)	5.7
1929	534,989	280	40,241	36,799	3,442	8.6	6.9
1930	467,526	297	42,645	38,800	3,845	9.0	8.3
1931	382,089	312	39,529	36,172	3,357	8.5	9.5
1932	309,710	309	32,903	30,279	2,625	8.0	9.8
1933	333,630	290	37,682	34,558	3,124	8.3	10.4
1934	359,368	293	43,556	39,827	3,729	8.6	11.1
1935	372,373	320	49,473	45,361	4,112	8.3	12.2
1936	439,088	342	67,162	61,095	6,067	9.0	13.9
1937	445,531	(1)	(1)	65,000	(1)	(1)	14.6
1938	348,545	374	71,207	63,455	7,752	10.9	18.2
1939	394,855	366	88,895	79,429	9,466	10.6	20.1
1940	460,771	387	115,692	102,270	13,422	11.6	22.2
1941	514,149	417	133,379	117,540	15,839	11.9	22.9
1942	582,693	438	162,598	142,187	20,411	12.6	24.4
1943	590,177	432	167,310	145,576	21,734	13.0	24.7
1944	619,576	439	182,071	158,727	23,344	12.8	25.6
1945	577,617	439	172,899	147,886	25,013	14.5	25.6
1946	533,922	445	163,633	138,670	24,963	15.3	26.0
1947	630,624	461	206,620	174,436	32,184	15.6	27.7
1948	599,518	502	215,217	189,880	34,337	16.0	30.2
1949	437,868	571	184,691	153,652	31,039	16.8	35.1
1950	516,311	612	238,391	198,699	39,692	16.7	38.5
1951	533,665	631	289,838	240,010	49,828	17.2	45.0
1952	466,841	625	274,246	227,265	46,981	17.1	48.7
1953	457,290	611	295,654	241,759	53,895	18.2	52.9
1954	391,706	613	287,005	232,764	54,240	18.9	59.4
1955	464,633	575	335,458	272,715	62,743	18.7	58.7
1956	500,874	583	359,378	292,365	67,013	18.6	58.4
1957	492,704	593	376,546	304,027	72,519	19.3	61.7
1958	410,446	573	320,898	259,035	61,863	19.3	63.1
1959	412,028	555	337,138	269,787	67,351	20.0	65.5
1960	415,512	535	337,686	273,169	65,517	19.3	65.7
1961	402,977	503	328,200	264,711	63,489	19.3	65.7
1962	422,149	508	339,408	271,633	67,775	20.0	64.3
1963	458,928	499	362,141	289,462	72,679	20.1	63.1

[1] Data not available.

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TABLE 47.—Mechanical cleaning at bituminous coal and lignite mines in the United States, 1963, by States

State	Total production (net tons)	Mechanical cleaning					Percentage of total production mechanically cleaned
		Number of cleaning plants	Raw coal (net tons)	Cleaned coal (net tons)	Refuse (net tons)	Percentage of refuse to raw coal	
Alabama	12,358,962	31	15,906,268	10,493,014	5,413,254	34.0	84.9
Alaska	853,398	4	633,984	378,856	255,128	40.2	44.4
Arkansas	220,650	[1]	[1]	[1]	[1]	[1]	[1]
Colorado	3,690,512	[2] 4	[2] 1,336,189	[2] 1,033,831	[2] 302,358	[2] 22.6	[2] 26.4
Illinois	51,736,316	53	56,089,541	45,786,182	10,303,359	18.4	88.5
Indiana	15,099,679	15	13,896,858	11,153,201	2,743,657	19.7	73.9
Kansas	1,168,679	4	1,651,393	1,139,460	511,933	31.0	97.5
Kentucky	77,350,451	73	51,611,353	41,919,493	9,691,860	18.8	54.2
Missouri	3,174,502	6	3,057,523	2,148,481	909,042	29.7	67.7
Montana (bituminous)	53,466	2	6,496	5,849	647	10.0	10.9
New Mexico	1,944,850	1	529,556	293,371	236,185	44.6	15.1
Ohio	36,789,830	20	16,791,931	13,432,566	3,359,365	20.0	36.5
Oklahoma	1,007,656	2	207,273	175,644	31,629	15.3	17.4
Pennsylvania	71,500,953	89	57,493,374	45,132,123	12,361,251	21.5	63.1
Tennessee	6,121,064	1	86,873	82,530	4,343	5.0	1.3
Utah	4,359,531	7	3,509,580	2,914,094	595,486	17.0	66.8
Virginia	30,530,995	29	15,504,352	12,958,882	2,545,470	16.4	42.4
Washington	190,225	3	275,148	186,833	88,315	32.1	98.2
West Virginia	132,567,763	153	123,505,570	100,181,839	23,323,731	18.9	75.6
Wyoming	3,124,105	2	48,536	46,156	2,380	4.9	1.5
Other States [3]	5,084,588						
Total	458,928,175	499	362,141,798	289,462,405	72,679,393	20.1	63.1

[1] Included in Colorado.
[2] Includes Arkansas.
[3] Includes Georgia, Iowa, Maryland, and lignite from Montana, North Dakota, and South Dakota.

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TABLE 48.—Mechanical cleaning of bituminous coal and lignite in the United States, by types of equipment

Year	Wet methods							Pneumatic methods	Grand total
	Jigs	Concentrating tables	Classifiers	Launders	Dense-medium processes	Unclassified [1]	Total		
CLEAN COAL (THOUSAND NET TONS)									
1938	27,615	984	4,521	10,681	4,450	4,936	53,187	10,268	63,455
1939	37,056	1,402	5,917	12,809	4,683	5,867	67,734	11,695	79,429
1940	47,064	2,330	7,762	16,269	6,692	7,173	87,290	14,980	102,270
1941	53,287	2,510	8,177	16,954	9,344	10,106	100,378	17,162	117,540
1942	66,876	3,138	10,529	18,658	12,495	10,304	122,000	20,187	142,187
1943	66,092	2,929	11,854	17,424	13,388	12,688	124,375	21,201	145,576
1944	74,175	2,753	14,780	19,686	13,869	13,400	138,663	20,064	158,727
1945	68,609	2,594	14,203	18,980	12,875	13,209	130,470	17,416	147,886
1946	64,702	1,447	13,883	16,021	14,173	11,833	122,059	16,611	138,670
1947	85,931	2,980	14,648	17,902	17,702	16,920	156,083	18,353	174,436
1948	87,506	4,360	18,304	16,788	20,638	17,068	164,664	16,216	180,880
1949	72,423	4,040	14,865	11,238	17,821	20,321	140,708	12,944	153,652
1950	94,161	4,693	18,059	11,630	28,948	25,679	183,170	15,529	198,699
1951	101,746	5,811	23,174	10,362	33,840	46,497	221,430	18,580	240,010
1952	97,336	3,723	19,296	11,738	31,321	45,205	208,619	18,646	227,265
1953	101,001	4,002	18,312	11,988	36,805	50,386	222,494	19,265	241,759
1954	99,913	6,606	16,115	12,156	43,104	36,143	214,037	18,727	232,764
1955	114,538	7,443	17,656	11,400	49,332	52,051	252,420	20,295	272,715
1956	124,858	9,535	15,064	10,223	56,937	51,437	268,054	24,311	292,365
1957	133,844	14,389	14,282	8,306	63,678	44,760	279,259	24,768	304,027
1958	115,321	18,142	8,793	6,768	52,735	38,394	240,153	18,882	259,035
1959	126,836	27,453	8,935	7,305	66,951	14,058	251,538	18,249	269,787
1960	136,633	30,741	11,012	7,561	66,251	2,832	255,030	18,139	273,169
1961	133,360	30,158	9,263	6,529	65,148	2,562	247,020	17,691	264,711
1962	136,879	31,859	5,681	5,986	68,565	3,959	252,929	18,704	271,633
1963	142,540	37,492	5,558	5,221	74,177	4,539	269,527	19,935	289,462
PERCENTAGE CLEANED									
1938	43.5	1.6	7.1	16.8	7.0	7.8	83.8	16.2	100.0
1939	46.6	1.8	7.5	16.1	5.9	7.4	85.3	14.7	100.0
1940	46.0	2.3	7.6	15.9	6.5	7.0	85.3	14.7	100.0
1941	45.3	2.2	7.0	14.4	7.9	8.6	85.4	14.6	100.0
1942	47.0	2.2	7.4	13.1	8.8	7.3	85.8	14.2	100.0
1943	45.4	2.0	8.1	12.0	9.2	8.7	85.4	14.6	100.0
1944	46.7	1.8	9.3	12.4	8.8	8.4	87.4	12.6	100.0
1945	46.4	1.8	9.6	12.8	8.7	8.9	88.2	11.8	100.0
1946	46.7	1.0	10.0	11.6	10.2	8.5	88.0	12.0	100.0
1947	49.3	1.7	8.4	10.3	10.1	9.7	89.5	10.5	100.0
1948	48.4	2.4	10.1	9.3	11.4	9.4	91.0	9.0	100.0
1949	47.1	2.6	9.7	7.3	11.6	13.3	91.6	8.4	100.0
1950	47.4	2.4	9.1	5.8	14.6	12.9	92.2	7.8	100.0
1951	42.4	2.4	9.7	4.3	14.1	19.4	92.3	7.7	100.0
1952	42.8	1.6	8.5	5.2	13.8	19.9	91.8	8.2	100.0
1953	41.8	1.6	7.6	4.9	15.2	20.9	92.0	8.0	100.0
1954	42.8	3.0	5.7	3.9	21.8	17.9	95.1	4.9	100.0
1955	42.0	2.7	6.5	4.2	18.1	19.1	92.6	7.4	100.0
1956	42.7	3.3	5.1	3.5	19.5	17.6	91.7	8.3	100.0
1957	44.0	4.8	4.7	2.7	21.0	14.7	91.9	8.1	100.0
1958	44.5	7.0	3.4	2.6	20.4	14.8	92.7	7.3	100.0
1959	47.0	10.2	3.3	2.7	24.8	5.2	93.2	6.8	100.0
1960	50.0	11.3	4.0	2.8	24.3	1.0	93.4	6.6	100.0
1961	50.4	11.4	3.5	2.4	24.6	1.0	93.3	6.7	100.0
1962	50.4	11.7	2.1	2.2	25.2	1.5	93.1	6.9	100.0
1963	49.2	13.0	1.9	1.8	25.6	1.6	93.1	6.9	100.0

[1] Of the total unclassified tonnage in 1960, 1,826,000 net tons was cleaned by flotation. In 1961–63, all of the tonnage under "Unclassified" was cleaned by flotation.

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TABLE 49.—Mechanical cleaning at bituminous coal and lignite mines in the United States, by underground, strip, and auger mining

Year	Underground mines			Strip mines		
	Total production (net tons)	Cleaned		Total production (net tons)	Cleaned	
		Net tons	Percent		Net tons	Percent
1953	349,550,972	194,934,599	55.8	105,448,569	46,202,508	43.8
1954	289,112,031	184,372,053	63.8	98,134,250	47,772,295	48.7
1955	343,465,239	217,199,126	63.2	115,092,769	54,423,341	47.3
1956	365,774,043	232,231,914	63.5	127,055,382	58,271,513	45.9
1957	360,649,141	242,981,446	67.4	124,108,538	59,317,324	47.8
1958	286,884,244	198,710,828	69.3	116,241,787	58,932,257	50.7
1959	283,433,655	203,829,017	71.9	120,953,334	64,417,972	53.3
1960	284,888,310	205,804,076	72.2	122,629,664	66,356,125	54.1
1961	272,765,985	199,359,507	73.1	121,979,084	64,500,929	52.9
1962	281,266,368	200,662,784	71.3	130,300,224	69,489,985	53.3
1963	302,256,400	215,717,996	71.4	144,140,677	72,032,483	50.0

	Auger mines			Total, all mines		
	Total production (net tons)	Cleaned		Total production (net tons)	Cleaned	
		Net tons	Percent		Net tons	Percent
1953	2,290,908	621,470	27.1	457,290,449	241,758,577	52.9
1954	4,460,019	619,675	13.9	391,706,300	232,764,023	59.4
1955	6,075,400	1,093,017	18.0	464,633,408	272,715,484	58.7
1956	8,044,652	1,861,957	23.1	500,874,077	292,365,384	58.4
1957	7,946,237	1,728,424	21.8	493,703,916	304,027,194	61.7
1958	7,319,516	1,391,766	19.0	410,445,547	259,034,851	63.1
1959	7,640,513	1,539,698	20.2	412,027,502	269,786,687	65.5
1960	7,994,373	1,008,493	12.6	415,512,347	273,168,694	65.7
1961	8,231,733	850,506	10.3	402,976,802	264,710,942	65.7
1962	10,582,733	1,479,830	14.0	422,149,325	271,632,599	64.3
1963	12,531,098	1,711,926	13.7	458,928,175	289,462,405	63.1

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TABLE 50.—Mechanical cleaning at bituminous coal and lignite mines in the United States, 1963, by States and by underground, strip, and auger mining

State	Underground mines			Strip mines			Auger mines			Total, all mines		
	Total production (net tons)	Cleaned		Total production (net tons)	Cleaned		Total production (net tons)	Cleaned		Total production (net tons)	Cleaned	
		Net tons	Percent		Net tons	Percent		Net tons	Percent		Net tons	Percent
Alabama	9,465,520	9,091,107	96.0	2,792,803	1,305,868	46.8	100,639	96,039	95.4	12,358,962	10,493,014	84.9
Alaska				853,398	378,856	44.4				853,398	378,856	44.4
Arkansas	75,218	(1)	(1)	145,432	(1)	(1)				220,650	(1)	(1)
Colorado	2,833,929	[2] 1,011,704	[2] 34.8	856,583	[2] 22,127	[2] 2.2				3,690,512	[2] 1,033,831	[2] 26.4
Illinois	24,449,006	20,250,554	82.8	27,287,310	25,535,628	93.6				51,736,316	45,786,182	88.5
Indiana	4,160,196	3,117,455	74.9	10,939,483	8,035,746	73.5				15,099,679	11,153,201	73.9
Kansas	1,715			1,166,964	1,139,460	97.6				1,168,679	1,139,460	97.5
Kentucky	47,478,208	23,803,672	50.1	25,752,222	17,966,309	69.8	4,120,021	149,512	3.6	77,350,451	41,919,493	54.2
Missouri	30,634			3,136,868	2,148,481	68.5	7,000			3,174,502	2,148,481	67.7
Montana (bituminous)	50,466	5,849	11.6	3,000						53,466	5,849	10.9
New Mexico	313,402	293,371	93.6	1,631,448						1,944,850	293,371	15.1
Ohio	10,488,588	6,302,740	60.1	24,407,420	6,688,088	27.4	1,893,822	441,738	23.3	36,789,830	13,432,566	36.5
Oklahoma	53,360	42,126	78.9	954,296	133,518	14.0				1,007,656	175,644	17.4
Pennsylvania	46,102,430	38,510,514	83.5	24,467,772	6,559,377	26.8	930,751	62,232	6.7	71,500,953	45,132,123	63.1
Tennessee	3,379,480	18,335	.5	2,490,737	64,195	2.6	250,847			6,121,064	82,530	1.3
Utah	4,359,531	2,914,094	66.8							4,359,531	2,914,094	66.8
Virginia	26,793,030	12,436,463	46.4	2,301,051	388,561	16.9	1,436,914	133,858	9.3	30,530,995	12,958,882	42.4
Washington	182,868	179,476	98.1	7,357	7,357	100.0				190,225	186,833	98.2
West Virginia	121,327,345	97,694,380	80.5	7,449,314	1,658,912	22.3	3,791,104	828,547	21.9	132,567,763	100,181,839	75.6
Wyoming	117,529	46,156	39.3	3,006,576						3,124,105	46,156	1.5
Other States [3]	593,945			4,490,643						5,084,588		
Total	302,256,400	215,717,996	71.4	144,140,677	72,032,483	50.0	12,531,098	1,711,926	13.7	458,928,175	289,462,405	63.1

[1] Included in Colorado.
[2] Includes Arkansas.
[3] Includes Georgia, Iowa, Maryland, and lignite from Montana, North Dakota, and South Dakota.

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WATER USAGE

The Bureau of Mines collected detailed statistics on water at coal preparation plants for the first time for the year 1962. Table 51 gives the water usage and water disposal by States. The principal States, named in order of importance were: West Virginia, Illinois, Pennsylvania, Kentucky and Alabama. By far the major portion of the water used was recirculated.

The method of treatment of the water is shown in table 52. Practically none of the new water used at coal preparation plants was treated. The major portion of the recirculated was clarified by thickeners and settling ponds. A small amount was filtered.

The most significant thing about the water at coal preparation plants is that almost all of the water—98 percent—was from self-operated systems. Also, almost no saline water and only an insignificant amount of sewage effluent were used.

TABLE 51.—Water usage at bituminous coal and lignite preparation plants in the United States, 1962, by States

(Million gallons)

State	Water usage			Water disposal	
	New water	Recirculated water	Total	Consumed	Discharged
Alabama	2,330	7,363	9,693	352	1,978
Alaska	1,344	132	1,476	3	1,340
California	18	18	36	10	8
Colorado	5	15	20	1	4
Illinois	5,304	22,409	27,713	427	4,877
Indiana	1,190	8,685	9,875	142	1,048
Kansas	147	1,715	1,862	101	46
Kentucky	8,096	14,623	22,719	535	7,561
Missouri	226	1,067	1,293	109	116
Montana	2	20	22	----	2
New Mexico	41	300	341	4	38
Ohio	645	7,091	7,736	290	355
Oklahoma	26	132	158	11	15
Pennsylvania	2,682	23,483	26,165	768	1,914
Tennessee	1	----	1	----	1
Utah	995	1,399	2,394	626	369
Virginia	1,593	8,010	9,603	278	1,316
Washington	18	25	43	4	14
West Virginia	7,169	42,024	49,193	2,028	5,141
Wyoming	1	----	1	----	1
Total	31,833	138,511	170,344	5,689	26,144

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TABLE 52.—Water treatment at bituminous coal and lignite preparation plants, 1962, by method of treatment

Method of treatment	Type of Water					
	New water		Recirculated water		Waste water	
	Million gallons	Percent	Million gallons	Percent	Million gallons	Percent
None	24,688	82	1,978	1	4,179	22
Settle	1,489	5	116,309	82	12,284	64
Filter	696	2	7,840	5	1,808	9
Aerate	128	1	2,150	2	10	(1)
Soften	261	1	3,607	3		
Control of pH	2,209	7	3,904	3	585	3
Precipitate	339	1	3,244	2	221	1
Bactericide	186	1	3,120	2	25	(1)
Other	9	(1)	520	(1)	141	1

[1] Less than 1 percent.

MECHANICAL CRUSHING

TABLE 53.—Mechanical crushing of bituminous coal and lignite at mines in the United States [1]

Year	Number of mines crushing coal	Coal crushed (net tons)	Percentage of total production crushed	Year	Number of mines crushing coal	Coal crushed (net tons)	Percentage of total production crushed
1940	716	35,251,061	7.7	1954	982	122,288,369	31.2
1944	814	66,460,564	10.8	1955	1,225	161,470,318	34.8
1945	830	70,936,898	12.3	1956	1,370	172,389,802	34.4
1946	851	66,663,732	12.5	1957	1,452	173,098,257	35.0
1947	904	88,985,858	14.1	1958	1,359	146,749,108	35.8
1948	995	91,564,311	15.3	1959	1,393	151,225,633	36.7
1949	1,120	77,327,691	17.7	1960	1,348	160,875,418	38.7
1950	1,210	101,594,731	19.7	1961	1,217	146,765,297	36.4
1951	1,374	118,663,712	22.2	1962	1,202	159,654,414	37.8
1952	1,325	108,102,158	23.2	1963	1,288	183,006,848	39.9
1953	1,239	116,493,415	25.5				

[1] Data not available for 1941–43. Lignite and Virginia semianthracite mines are not included in 1940–49.

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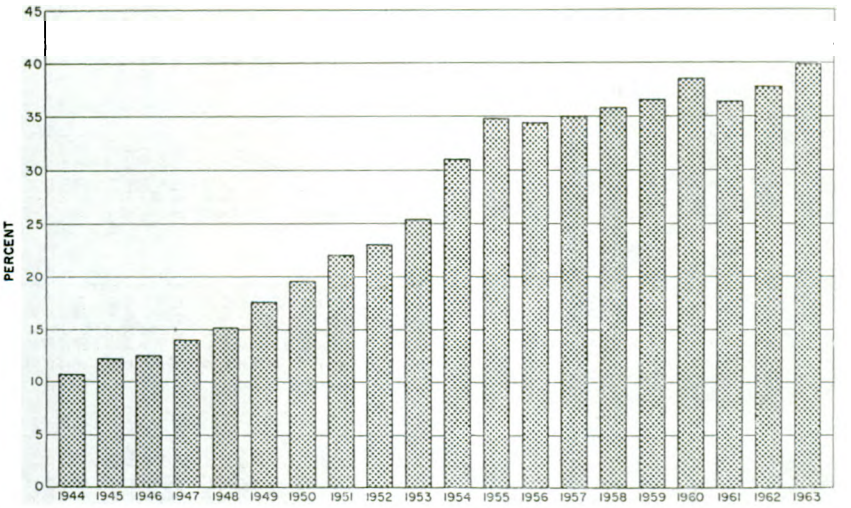

FIGURE 11.—Percentage of total production of bituminous coal and lignite crushed at mines in the United States, 1944–63

TABLE 54.—Mechanical crushing of bituminous coal and lignite at mines in the United States, by States

State	Number of mines crushing coal		Coal crushed (net tons)		Percentage of total production crushed	
	1962	1963	1962	1963	1962	1963
Alabama	23	40	4,872,350	4,952,341	37.8	40.1
Alaska	4	4	584,747	581,476	67.1	68.1
Arkansas	7	7	134,289	169,916	52.5	77.0
Colorado	45	39	1,131,507	1,401,598	33.5	38.0
Illinois	73	74	19,716,112	22,050,617	40.7	42.6
Indiana	26	29	7,317,593	8,421,531	46.6	55.8
Iowa	22	21	896,267	965,370	79.3	79.6
Kansas	2	4	604,563	762,486	66.1	65.2
Kentucky	125	156	22,198,454	25,058,206	32.1	32.4
Maryland	10	12	136,626	273,025	16.6	23.5
Missouri	12	10	821,736	1,410,377	28.4	44.4
Montana:						
Bituminous	7	8	25,836	18,466	33.3	34.5
Lignite	1	1	295,360	284,364	97.0	98.2
Total Montana	8	9	321,196	302,830	84.0	88.3
New Mexico	4	4	648,385	1,916,819	95.8	98.6
North Dakota (lignite)	14	15	1,925,840	1,767,238	70.5	73.7
Ohio	110	115	11,434,995	13,345,764	33.5	36.3
Oklahoma	9	6	657,296	701,469	62.7	69.6
Pennsylvania	271	280	31,972,226	39,421,652	49.0	55.1
South Dakota (lignite)	1	1	7,105	6,780	39.7	40.9
Tennessee	22	26	1,388,202	2,284,432	22.3	37.3
Utah	36	34	3,082,288	3,157,277	71.7	72.4
Virginia	62	48	10,145,277	11,515,637	34.4	37.7
Washington	7	5	43,025	20,129	18.3	10.6
West Virginia	300	338	37,570,603	39,508,385	31.7	29.8
Wyoming	9	11	2,043,732	3,011,493	79.6	96.4
Total	1,202	1,288	159,654,414	183,006,848	37.8	39.9

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TREATMENT FOR ALLAYING DUST

TABLE 55.—Treatment of bituminous coal and lignite at mines for allaying dust in the United States [1]

Year	Grand total production (net tons)	Percentage of total production treated	Net tons treated with—				
			Calcium chloride	Oil	Calcium chloride and oil	All other materials	Total
1940	460, 771, 500	7.7	2, 633, 291	25, 767, 651	4, 428, 113	2, 807, 728	35, 636, 783
1941	514, 149, 245	7.7	3, 957, 459	29, 258, 462	2, 482, 899	3, 844, 476	39, 543, 296
1942	582, 692, 937	6.0	10, 132, 809	11, 302, 020	6, 544, 658	7, 148, 064	35, 127, 551
1943	590, 177, 069	4.5	15, 049, 176	1, 720, 176	1, 947, 219	7, 966, 484	26, 683, 055
1944	619, 576, 240	5.0	7, 276, 702	13, 188, 883	4, 744, 580	5, 562, 565	30, 772, 730
1945	577, 617, 327	5.8	5, 115, 090	18, 875, 674	4, 647, 872	4, 910, 602	33, 549, 238
1946	533, 922, 068	6.9	4, 957, 622	24, 310, 109	3, 193, 070	4, 572, 360	37, 033, 161
1947	630, 623, 722	8.2	5, 822, 483	34, 667, 571	5, 571, 953	5, 732, 101	51, 794, 108
1948	599, 518, 229	8.4	6, 275, 121	34, 466, 534	4, 177, 987	5, 462, 054	50, 381, 696
1949	437, 868, 036	9.5	3, 670, 120	30, 448, 670	4, 380, 961	3, 275, 151	41, 774, 902
1950	516, 311, 053	10.5	4, 643, 186	41, 688, 159	4, 278, 212	3, 724, 314	54, 333, 871
1951	533, 664, 732	11.0	4, 694, 938	46, 142, 726	4, 587, 940	3, 172, 205	58, 597, 809
1952	466, 840, 782	11.0	4, 954, 080	41, 409, 886	3, 432, 199	1, 772, 111	51, 568, 276
1953	457, 290, 449	10.7	3, 362, 552	40, 671, 431	2, 769, 833	2, 154, 985	48, 958, 801
1954	391, 706, 300	14.4	2, 959, 979	47, 782, 165	3, 366, 955	2, 255, 872	56, 364, 971
1955	464, 633, 408	13.5	3, 160, 729	51, 157, 769	5, 696, 447	2, 513, 752	62, 528, 697
1956	500, 874, 077	12.9	5, 500, 522	52, 008, 545	4, 912, 374	2, 309, 732	64, 731, 173
1957	492, 703, 916	12.5	4, 112, 934	52, 051, 076	3, 809, 132	1, 852, 051	61, 825, 193
1958	410, 445, 547	13.0	3, 359, 434	42, 922, 129	4, 122, 397	2, 862, 670	53, 266, 630
1959	412, 027, 502	13.3	2, 716, 638	45, 139, 888	3, 419, 852	3, 403, 320	54, 679, 698
1960	415, 512, 347	13.9	4, 576, 176	46, 241, 261	4, 333, 350	2, 469, 508	57, 620, 295
1961	402, 976, 802	12.3	3, 616, 536	39, 130, 370	3, 448, 677	3, 385, 980	49, 581, 563
1962	422, 149, 325	11.8	3, 128, 468	39, 822, 318	3, 025, 489	4, 047, 823	50, 024, 098
1963	458, 928, 175	11.1	2, 405, 209	40, 834, 328	2, 674, 714	5, 254, 795	51, 169, 046

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Year	Number of mines treating with—					Percentage of tonnage treated with—				
	Calcium chloride	Oil	Calcium chloride and oil	All other materials	Total [2]	Calcium chloride	Oil	Calcium chloride and oil	All other materials	Total
1940	51	486	22	62	614	7.4	72.3	12.4	7.9	100.0
1941	67	564	15	58	668	10.0	74.0	6.3	9.7	100.0
1942	167	334	73	117	603	28.8	32.2	18.6	20.4	100.0
1943	212	67	28	101	393	56.4	6.4	7.3	29.9	100.0
1944	145	192	47	83	434	23.6	42.9	15.4	18.1	100.0
1945	105	296	43	67	487	15.2	56.3	13.9	14.6	100.0
1946	79	380	41	51	546	13.4	65.6	8.6	12.4	100.0
1947	67	384	58	45	546	11.2	66.9	10.8	11.1	100.0
1948	68	474	48	46	629	12.5	68.4	8.3	10.8	100.0
1949	91	586	62	34	769	8.8	72.9	10.5	7.8	100.0
1950	106	688	32	45	838	8.5	76.7	7.9	6.9	100.0
1951	98	764	40	27	898	8.0	78.8	7.8	5.4	100.0
1952	101	723	30	20	865	9.6	80.3	6.7	3.4	100.0
1953	81	681	28	26	785	6.8	83.1	5.7	4.4	100.0
1954	83	614	29	29	737	5.2	84.8	6.0	4.0	100.0
1955	63	650	33	28	757	5.1	81.8	9.1	4.0	100.0
1956	73	642	35	30	763	8.5	80.3	7.6	3.6	100.0
1957	71	665	31	34	785	6.6	84.2	6.2	3.0	100.0
1958	60	596	36	33	720	6.3	80.6	7.7	5.4	100.0
1959	54	615	44	37	743	5.0	82.6	6.2	6.2	100.0
1960	64	635	56	26	748	7.9	80.3	7.5	4.3	100.0
1961	48	544	32	32	643	7.3	78.9	7.0	6.8	100.0
1962	36	534	32	44	638	6.3	79.6	6.0	8.1	100.0
1963	32	579	24	35	661	4.7	79.8	5.2	10.3	100.0

[1] All items except "Grand total production" exclude lignite and semianthracite, 1940–49. Data for 1940–45 include all mines with an average daily production of 50 tons and all mines with rail or river connections regardless of size. Data for 1946–63 include all mines producing 1,000 or more tons. The figures are reasonably comparable for all years.

[2] Because some mines used more than one method of treatment, this total is not the sum of the individual items.

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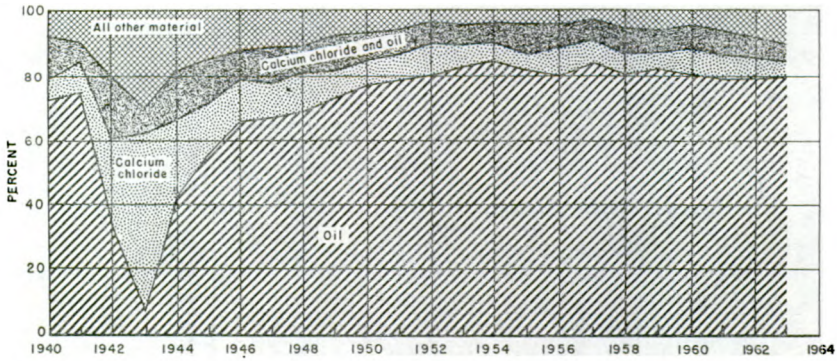

FIGURE 12.—Percentage of total bituminous coal and lignite treated for allaying dust at mines in the United States, 1940–63, by type of agent used.

TABLE 56.—Treatment of bituminous coal and lignite at mines for allaying dust in the United States, by States

State	Number of mines treating coal		Coal treated (net tons)		Percentage of total production treated	
	1962	1963	1962	1963	1962	1963
Alabama	4	10	88,549	104,817	.7	.8
Arkansas	2	1	3,170	2,000	1.2	.9
Colorado	38	34	239,237	381,688	7.1	10.3
Illinois	69	66	4,299,526	4,667,196	8.9	9.0
Indiana	23	21	1,003,775	845,337	6.4	5.6
Iowa	5	5	13,277	11,242	1.2	.9
Kansas	3	3	50,838	61,445	5.6	5.3
Kentucky	76	102	9,696,390	8,692,444	14.0	11.2
Maryland	1	1	10,000	10,000	1.2	.9
Missouri	6	4	73,267	43,643	2.5	1.4
Montana:						
Bituminous	8	8	24,474	21,474	31.5	40.2
Lignite						
Total Montana	8	8	24,474	21,474	6.4	6.3
New Mexico	2	3	395,284	1,612,948	58.4	82.9
North Dakota (lignite)	19	19	526,569	521,017	19.3	21.7
Ohio	32	37	3,601,739	4,298,301	10.6	11.7
Oklahoma	2	2	49,655	38,500	4.7	3.8
Pennsylvania	88	81	6,016,445	5,440,680	9.2	7.6
South Dakota (lignite)	1	1	7,105	6,780	39.7	40.9
Tennessee	1	1	400	400		
Utah	34	31	2,017,895	1,746,087	47.0	40.1
Virginia	31	27	4,368,987	3,379,875	14.8	11.1
Washington		1		600		.3
West Virginia	182	194	17,314,930	19,065,391	14.6	14.4
Wyoming	11	9	222,586	217,181	8.7	7.0
Total	638	661	50,024,098	51,169,046	11.8	11.1

THERMAL DRYING

Because most of the bituminous coal and lignite produced in the United States is either sprayed with water underground to reduce the dust in mining, cleaned by wet methods, or subjected to wet screening in the tipple, the problem of removing surface moisture is vital. The moisture must be removed for any one or a combination of the following reasons: (1) To avoid freezing difficulties and to facilitate handling

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the coal during shipment and transfer to the firebox; (2) to reduce the heat wasted in evaporation of surface moisture on the coal, thus increasing efficiency in burning; (3) to decrease transportation costs; (4) to improve the coal so that it may be used for specific purposes, such as producing coke and briquets; and (5) to facilitate drycleaning.

Removal of surface water from fine coal usually presents an individual problem at each preparation plant. Fine coal has a greater surface area per unit weight than coarse coal; therefore, its capacity for retaining moisture is proportionately greater. Removing water from coarse coal is relatively easy, but the problem is greater with coal that is 10 mesh or finer.[4]

The two components of the total moisture content of wetwashed coal are inherent moisture and surface moisture. Inherent moisture is present in the coal in the bed. Surface moisture is attached to the surface of the coal particles or retained in cracks and fissures other than capillary openings in the coal substance.

There are three principal methods of removing surface moisture from coal: (1) Gravity drainage, (2) mechanical dewatering, and (3) thermal drying. Thermal drying is generally used on coals that cannot be readily dried by gravity drainage or mechanical means, such as screens, centrifuges, and filters.

The annual reports of bituminous coal and lignite producers to the Bureau of Mines for 1957 included data on thermal drying for the first time. These and succeeding reports have included data on thermal drying only at the preparation plant and have not included thermal drying at powerplants or other industrial plants.

Thermal driers have been divided into seven groups: (1) Continuous carrier, (2) fluidized-bed, (3) multilouvre, (4) rotary, (5) screen, (6) suspension or flash, and (7) vertical tray and cascade.

Each type of thermal drier has been designed to handle a definite range of sizes of coal. The size of coal most commonly reported as thermally dried in 1963 was ¼- by 0-inch coal.

More than 17 percent of the bituminous coal mechanically cleaned in 1963 was thermally dried.

Bituminous coal and lignite thermally dried amounted to 51 million tons, or 11 percent of the total production in the United States.

TABLE 57.—Thermal drying of bituminous coal and lignite in the United States, by type of drying equipment

Type of drier	Number of thermal drying units		Thermally dried (net tons)		Percentage of total	
	1962	1963	1962	1963	1962	1963
Continuous carrier	4	4	659,950	739,165	1.4	1.5
Fluidized-bed	29	38	12,432,991	14,857,074	26.5	29.4
Multilouvre	49	44	9,631,349	9,469,847	20.5	18.7
Rotary	11	11	1,998,254	2,549,294	4.2	5.0
Screen	56	53	8,271,683	8,760,509	17.6	17.3
Suspension or flash	58	49	8,105,551	8,131,081	17.3	16.1
Vertical tray and cascade	59	54	5,856,812	6,048,360	12.5	12.0
Total	266	253	46,956,590	50,555,330	100.0	100.0

[4] Lyons, Orville R. Dewatering and Thermal Drying. Ch. in Coal Preparation. AIME, 2d. ed., 1950, pp. 648–715.

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TABLE 58.—Comparison of thermal drying of bituminous coal and lignite with mechanical cleaning at mines in the United States, by States

State	Cleaning plants, number				Production mechanically cleaned (net tons)		Thermally dried (net tons)		Percentage of cleaned coal thermally dried	
	Total		With thermal drying							
	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
Illinois	54	53	21	23	43,918,398	45,786,182	7,177,923	8,709,766	16.3	19.0
Indiana	16	15	10	10	11,847,002	11,153,201	3,063,153	2,977,990	25.9	26.7
Kentucky	77	73	9	7	41,726,820	41,919,493	2,878,716	2,200,392	6.9	5.2
North Dakota (lignite)							370,000	290,000		
Ohio	20	20	6	6	13,186,941	13,432,566	1,922,312	2,460,475	14.6	18.3
Pennsylvania	91	89	15	15	40,261,140	45,132,123	4,223,202	4,765,130	10.5	10.6
Utah	7	7	4	4	2,774,284	2,914,094	1,518,269	1,668,009	54.7	57.2
Virginia	24	29	3	3	12,832,402	12,958,882	3,753,008	3,356,801	29.2	25.9
Washington	5	3	1	1	230,037	186,833	170,507	129,816	74.1	69.5
West Virginia	153	153	48	53	88,933,759	100,181,839	21,879,500	23,996,951	24.6	24.0
Other States	61	57			15,921,816	15,797,192				
Total	508	499	117	122	271,632,599	289,462,405	46,956,590	50,555,330	[1] 17.2	[1] 17.4

[1] Excludes North Dakota.

TABLE 59.—Thermal drying of bituminous coal and lignite at mines in the United States, by States

State	Number of thermal drying units		Grand total production (net tons)		Thermally dried (net tons)		Percentage of total production thermally dried	
	1962	1963	1962	1963	1962	1963	1962	1963
Illinois	50	53	48,487,362	51,736,316	7,177,923	8,709,766	14.8	16.8
Indiana	28	28	15,708,902	15,099,679	3,063,153	2,977,990	19.5	19.7
Kentucky	17	10	69,212,019	77,350,451	2,878,716	2,200,392	4.2	2.8
North Dakota (lignite)	4	4	2,732,854	2,398,988	370,000	290,000	13.5	12.1
Ohio	19	18	34,124,663	36,789,830	1,922,312	2,460,475	5.6	6.7
Pennsylvania	30	22	65,315,386	71,500,953	4,223,202	4,765,130	6.5	6.7
Utah	4	4	4,297,020	4,359,531	1,518,269	1,668,009	35.3	38.3
Virginia	20	17	29,474,323	30,530,995	3,753,008	3,356,801	12.7	11.0
Washington	2	1	234,957	190,225	170,507	129,816	72.6	68.2
West Virginia	92	96	118,499,067	132,567,763	21,879,500	23,996,951	18.5	18.1
Other States			34,062,772	36,403,444				
Total	266	253	422,149,325	458,928,175	46,956,590	50,555,330	11.1	11.0

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PRODUCTION BY STATES AND COUNTIES

Detailed production and employment statistics are shown in table 60 for each coal-producing county in the United States from which three or more operators submitted reports for 1963. Statistics on counties with less than three reporting producers have been combined with data for "Other counties" to avoid disclosing individual figures, except when the Bureau has been granted permission to publish statistics separately. Production of mines on the border between two States has been credited to the State in which the coal was mined rather than to the State where the tipple was. If the coal was mined in both States, the tonnage was apportioned accordingly.

Bituminous coal and lignite were mined in 25 States and 312 counties. As soft coal is the source of a large part of the economic activity in many counties, the key items pertaining to the industry are published by counties and are useful in analyzing potential markets. These key items are (1) method of shipping the coal, (2) value, (3) number of men working daily, (4) days worked, and (5) tons per man per day.

The most striking fact illustrated by the following table is the wide variation among several counties in the same State, not only in production but also in average value and average tons per man per day. The differences in average value are due to quality of coal, method of mining, method of transportation, or market conditions. The differences in output per man per day are caused mostly by physical conditions, mining methods, and extent of mechanization.

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TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1963, by States and counties

County	Production (net tons)				Average value per ton [3]	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total					
ALABAMA									
Bibb		80,018		80,018	$5.54	55	99	5,463	14.65
Blount	95,808			95,808	5.49	26	320	8,331	11.50
Cullman		11,000		11,000	6.28	14	128	1,792	6.14
Jackson		19,073		19,073	7.60	38	100	3,815	5.00
Jefferson	6,321,543	369,561	497	6,691,601	7.84	3,285	211	693,646	9.65
Marion	83,849	271,084	21	354,954	5.71	475	201	95,671	3.71
Shelby	482,873	61,645		544,518	8.74	266	231	61,527	8.85
Tuscaloosa	340,435	142,300		482,735	4.38	104	186	19,390	24.90
Walker	3,053,640	152,709	758,933	3,965,282	7.08	1,060	196	208,250	19.04
Winston	56,146	57,827		113,973	5.36	25	244	6,095	18.70
Total Alabama	10,434,294	1,165,217	759,451	12,358,962	7.38	5,348	206	1,103,980	11.19
ALASKA									
Total Alaska	831,807	13,024	8,567	853,398	$6.93	196	255	49,906	17.10
ARKANSAS									
Franklin	80,686			80,686	$6.65	17	221	3,755	21.49
Johnson	107,925	401		108,326	7.01	65	216	14,018	7.73
Logan	6,492			6,492	8.96	28	70	1,950	3.33
Sebastian	17,823	7,303	20	25,146	6.03	27	144	3,897	6.45
Total Arkansas	212,926	7,704	20	220,650	6.82	137	172	23,620	9.34

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COLORADO									
Delta	6,390	27,160	857	34,407	5.79	47	123	5,802	5.93
El Paso	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Fremont	4,731	317,183	52	321,966	3.78	102	202	20,577	15.65
Garfield		8,266		8,266	7.48	13	147	1,913	4.82
Gunnison	110,550	42,058	3,706	156,314	5.95	169	190	32,032	4.88
Huerfano	2,659	39,968		42,627	6.52	45	170	7,653	5.57
La Plata		24,996	10	25,006	4.30	22	162	3,640	6.87
Las Animas	748,600	22,844	952	772,396	9.54	438	226	99,025	7.80
Mesa		14,580	63,882	78,462	5.45	46	167	7,668	10.23
Moffat	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Montrose	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Pitkin	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Rio Blanco	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Routt	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Weld	473,540	238,898	8,593	721,031	4.11	229	199	45,520	15.84
Other counties	1,390,606	139,325	106	1,530,037	5.45	316	207	65,292	23.43
Total Colorado	2,737,076	875,278	78,158	3,690,512	5.93	1,427	203	289,122	12.76
GEORGIA									
Walker		4,550		4,550	3.63	15	112	1,680	2.71
ILLINOIS									
Adams		33,332	177	33,509	$6.99	16	153	2,444	13.71
Bureau	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Christian	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Douglas	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Franklin	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Fulton	5,738,925	473,316	10,347	6,272,588	3.99	840	253	212,486	29.52
Gallatin	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Greene	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Grundy	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Henry	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Jackson	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Jefferson	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Knox	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Logan		19,796	30	19,826	4.96	19	130	2,466	8.04
Macoupin	237,604	46,439	2,744	286,787	3.83	158	168	26,481	10.83
Madison	31,048	546,954	2,238	580,240	4.06	264	195	51,349	11.30
Marion	3,847	1,671	880	6,398	3.70	23	51	1,149	5.57
Menard		3,164		3,164	6.19	6	100	633	5.00
Mercer	45,798	17,500		63,298	4.21	21	209	4,380	14.45
Montgomery	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)

See footnotes at end of table.

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TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1963, by States and counties—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total					
ILLINOIS—Continued									
Peoria	602,470	339,709	473	942,652	$4.90	135	259	34,975	26.95
Perry	3,379,621	142,339	4,413	3,526,373	3.43	284	307	87,082	40.49
Randolph	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
St. Clair	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Saline	3,698,220	97,752	6,894	3,802,866	3.75	681	249	169,758	22.40
Sangamon	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Schuyler	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Stark	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Vermilion	845,863	304,777	3,275	1,153,915	4.32	168	256	43,076	26.79
Wabash		3,076		3,076	4.13	2	119	238	12.92
Washington	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Will	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Williamson	6,029,431	356,759	15,469	6,401,659	3.79	1,213	250	303,429	21.10
Other counties	25,171,071	3,410,965,	57,929	28,639,965	3.74	4,329	242	1,048,620	27.31
Total Illinois	45,833,898	5,797,549	104,869	51,736,316	3.80	8,159	244	1,988,566	26.02
INDIANA									
Clay	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Daviess	4,900	27,235		32,135	$4.65	16	185	2,959	10.86
Dubois		7,790		7,790	4.00	8	119	953	8.17
Fountain	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Gibson	433,411	99,105	23,560	556,076	4.28	303	175	53,010	10.49
Greene	1,452,119	72,597	5,706	1,530,422	3.83	212	269	56,972	26.86
Knox		23,089		23,089	4.09	25	116	2,904	7.95
Owen	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Parke		7,577		7,577	3.76	12	245	2,937	2.58
Pike	1,754,217	178,159	2,915	1,935,291	3.71	301	258	77,765	24.89
Spencer	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Sullivan	1,526,401	167,211	4,419	1,698,031	4.10	456	230	104,863	16.19
Vermillion		11,579		11,579	6.00	30	85	2,545	4.55
Vigo	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Warrick	5,407,599	387,464	3,511	5,798,574	3.53	590	235	138,779	41.78
Other counties	1,643,022	1,175,607	680,486	3,499,115	3.96	840	210	176,615	19.81
Total Indiana	12,221,669	2,157,413	720,597	15,099,679	3.78	2,793	222	620,302	24.34

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IOWA									
Appanoose	4,791	31,260	700	36,751	5.79	117	137	16,048	2.29
Lucas	34,091	12,716		46,807	4.16	21	279	5,851	8.00
Mahaska	279,278	52,071		331,349	3.32	68	300	20,403	16.24
Marion	519,733	139,217	367	659,317	3.39	128	227	29,089	22.67
Monroe	40,683	11,749		52,432	3.33	22	114	2,498	20.99
Van Buren		18,539	15	18,554	4.84	9	130	1,170	15.86
Wapello		67,779		67,779	3.50	17	293	4,980	13.61
Total Iowa	878,576	333,331	1,082	1,212,989	3.50	382	210	80,039	15.15
KANSAS									
Bourbon	5,154	3,875		9,029	4.42	7	111	780	11.58
Cherokee	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Coffey		1,319		1,319	4.54	2	117	234	5.64
Crawford	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Osage		1,715		1,715	4.54	6	150	858	2.00
Other counties	891,306	262,930	2,380	1,156,616	4.55	222	249	55,178	20.96
Total Kansas	896,460	269,839	2,380	1,168,679	4.54	237	241	57,050	20.49

See footnotes at end of table.

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TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1963, by States and counties—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total					
KENTUCKY									
Eastern Kentucky:									
Bell	866,499	527,209	400	1,394,108	$3.09	1,297	113	146,979	9.49
Boyd		54,041	2,805	56,846	3.62	41	119	4,868	11.68
Breathitt	157,830	94,575		252,405	5.11	255	106	26,908	9.38
Carter		29,500		29,500	3.38	41	127	5,230	5.64
Clay	534,858	748,496	25	1,283,379	3.88	885	188	166,464	7.71
Clinton		4,400		4,400	4.77	14	48	671	6.56
Elliott		14,895		14,895	3.75	16	246	3,940	3.78
Floyd	3,983,529	374,165	6,912	4,364,606	5.51	1,780	221	393,534	11.09
Greenup	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Harlan	4,853,649	837,077	7,474	5,698,200	5.06	2,539	188	478,577	11.91
Jackson	40,000	13,628		53,628	4.89	84	85	7,135	7.52
Johnson	178,516	58,212	30	236,758	3.37	136	147	19,929	11.88
Knott	2,310,286	141,598		2,451,884	2.78	1,518	119	180,369	13.59
Knox	251,865	146,628		398,493	3.26	361	134	48,270	8.26
Laurel	165,390	10,954		176,344	2.88	113	112	12,633	13.96
Lawrence	24,223	11,058		35,281	3.65	18	146	2,632	13.40
Lee	13,720	64,347	2,000	80,067	3.75	52	216	11,245	7.12
Leslie	1,909,897	348,318	1,521	2,259,736	4.10	1,077	212	228,037	9.91
Letcher	4,958,139	284,290	8,826	5,251,255	4.67	1,829	205	374,602	14.02
McCreary	308,748	24,048		332,796	3.74	185	194	35,862	9.28
Magoffin	73,077	39,858		112,935	3.00	36	119	4,282	26.37
Martin	120,000	14,010		134,010	4.56	56	169	9,477	14.14
Morgan		31,804		31,804	4.55	28	114	3,181	10.00
Owsley		4,000		4,000	4.56	11	75	800	5.00
Perry	3,544,455	115,740	3,799	3,663,994	3.93	1,332	181	241,604	15.17
Pike	10,024,793	2,410,738	23,521	12,459,052	3.99	4,886	184	897,101	13.89
Pulaski	104,060	30,878		134,938	2.74	58	133	7,705	17.51
Rockcastle		5,660		5,660	3.97	10	115	1,145	4.94
Wayne	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Whitley	465,786	232,446		698,232	3.61	438	161	70,610	9.89
Wolfe		10,066		10,066	5.90	15	159	2,385	4.22
Other counties		5,580		5,580	4.64	25	104	2,593	2.15
Total Eastern Kentucky	34,889,320	6,688,219	57,313	41,634,852	4.26	19,136	177	3,388,768	12.29

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Western Kentucky:									
Butler	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Christian	58,659			58,659	4.96	15	227	3,408	17.21
Daviess	662,669	178,510	7,500	848,679	2.60	100	252	25,172	33.72
Hancock	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Henderson		144,130	5,380	149,510	3.03	128	93	11,932	12.53
Hopkins	10,680,866	479,980	949	11,161,795	3.44	2,247	215	483,561	23.08
McLean	51,454	13,838		65,292	2.73	19	157	2,984	21.88
Muhlenberg	13,021,835	3,180,941	1,085	16,203,861	3.19	1,328	259	344,092	47.09
Ohio	3,398,312	46,749		3,445,061	3.25	372	241	89,800	38.36
Union	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Webster	324,808	31,686		356,494	2.67	74	159	11,740	30.37
Other counties	3,204,521	221,727		3,426,248	3.83	844	212	179,290	19.11
Total Western Kentucky	31,403,124	4,297,561	14,914	35,715,599	3.32	5,127	225	1,151,979	31.00
Total Kentucky	66,292,444	10,985,780	72,227	77,350,451	3.82	24,263	187	4,540,747	17.03
MARYLAND									
Allegany	60,318	146,787		207,105	4.11	173	145	24,999	8.28
Garrett	571,387	383,476		954,863	3.64	353	209	73,707	12.95
Total Maryland	631,705	530,263		1,161,968	3.73	526	188	98,706	11.77
MISSOURI									
Adair		19,754	300	20,054	5.24	30	166	5,039	3.98
Boone	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Callaway		27,856		27,856	4.95	6	313	1,875	14.86
Clark		8,390		8,390	5.50	5	187	932	9.00
Dade		19,000		19,000	4.71	10	285	2,849	6.67
Henry	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Lafayette	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Macon	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Putnam	44,000	78,351	18	122,369	3.59	45	214	9,646	12.69
Randolph		4,670		4,670	5.24	10	113	1,127	4.14
St. Clair	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Vernon	18,949	4,744	8	23,701	3.89	25	94	2,387	9.93
Other counties	1,903,173	234,959	810,330	2,948,462	4.16	355	270	95,985	30.72
Total Missouri	1,966,122	397,724	810,656	3,174,502	4.16	486	247	119,840	26.49

See footnotes at end of table.

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TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1963, by States and counties—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total					
MONTANA									
Bituminous coal:									
Blaine		2,850	40	2,890	$8.98	7	96	675	4.28
Carbon	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Musselshell	526	33,004	285	33,815	7.35	38	112	4,206	8.04
Rosebud	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Other counties	4,535	12,161	65	16,761	7.58	28	109	3,047	5.50
Total bituminous coal	5,061	48,015	390	53,466	7.51	73	109	7,928	6.74
Lignite:									
Powder River	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Richland	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Sheridan		2,653		2,653	4.00	4	180	721	3.68
Other counties	284,364	2,510	5	286,879	1.93	20	210	4,196	68.37
Total lignite	284,364	5,163	5	289,532	1.95	24	205	4,917	58.88
Total Montana	289,425	53,178	395	342,998	2.82	97	132	12,845	26.70
NEW MEXICO									
Colfax	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
McKinley	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Rio Arriba	1,684	761		2,445	6.37	20	68	1,358	1.80
Sandoval		2,052		2,052	5.92	6	144	862	2.38
San Juan	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Other counties	715,774	23,534	1,201,045	1,940,353	2.89	278	207	57,625	33.67
Total New Mexico	717,458	26,347	1,201,045	1,944,850	2.89	304	197	59,845	32.50

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NORTH DAKOTA (LIGNITE)

Adams	18,263	8,973		27,236	2.67	8	255	2,040	13.35
Bowman	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Burke	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Burleigh		9,994		9,994	3.34	3	136	408	24.50
Divide	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Dunn		3,214	500	3,714	2.92	3	130	390	9.52
Grant		19,590		19,590	3.05	7	134	937	20.91
Hettinger		3,487		3,487	4.36	1	160	160	21.79
McLean	16,936	38,030	6,333	61,299	3.28	19	146	2,771	22.12
Mercer	950,971	9,252	82,355	1,042,578	2.06	101	200	20,166	51.70
Morton		12,784		12,784	2.60	6	110	659	19.40
Oliver		7,623		7,623	2.50	4	82	326	23.38
Stark	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Ward	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Williams		1,880		1,880	4.60	3	70	209	9.00
Other counties	821,785	209,635	177,383	1,208,803	2.19	157	231	36,267	33.33
Total North Dakota	1,807,955	324,462	266,571	2,398,988	2.19	312	206	64,333	37.29

OHIO

Athens	49,708	141,095	802	191,605	4.44	172	133	22,906	8.36
Belmont	5,819,109	438,913	112,901	6,370,923	4.05	1,534	226	347,428	18.34
Carroll	35,495	273,239	2,259	310,993	3.48	84	226	18,993	16.37
Columbiana	147,895	1,163,402	433	1,311,730	3.36	292	249	72,799	18.02
Coshocton	186,208	704,707	1,164,198	2,055,113	4.14	357	225	80,384	25.56
Gallia	598,113	44,110	316	642,539	3.28	169	229	38,745	16.58
Guernsey	341,651	26,027	41	367,719	3.33	96	221	21,189	17.35
Harrison	8,343,045	722,066	625,559	9,690,670	3.99	1,938	240	464,703	20.85
Hocking		80,962	100	81,062	4.05	40	165	6,619	12.25
Holmes	121,359	177,515		298,874	2.79	45	260	11,748	25.44
Jackson	12,578	399,464	100	412,142	3.87	126	244	30,745	13.41
Jefferson	2,307,583	1,632,906	1,602	3,942,091	3.55	875	226	198,115	19.90
Lawrence	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Mahoning		908,813	3,765	912,578	4.19	198	258	51,153	17.84
Meigs	11,615	333,983		345,598	2.97	138	155	21,407	16.14
Morgan		17,005	2,455,282	2,472,287	3.06	249	251	62,495	39.56
Muskingum		103,162		103,162	4.23	72	196	14,144	7.29
Noble	994,655	516,981	239,875	1,751,511	2.65	234	195	45,725	38.31
Perry	1,392,094	632,210		2,024,304	3.75	264	271	71,418	28.34
Portage		75,191	4,696	79,887	3.62	22	311	6,840	11.68
Stark		571,605	187	571,792	3.20	152	229	34,717	16.47
Tuscarawas	226,935	2,162,088	8,123	2,397,146	3.45	711	222	157,777	15.19
Vinton		52,585		52,585	4.35	64	174	11,107	4.73
Washington	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Wayne		85,483		85,483	3.24	40	273	10,903	7.84
Other counties	40,000	263,036	15,000	318,036	3.24	64	151	9,664	32.91
Total Ohio	20,628,043	11,526,548	4,635,239	36,789,830	3.70	7,936	228	1,811,724	20.31

See footnotes at end of table.

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TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1963, by States and counties—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total					
OKLAHOMA									
Craig	286,447	30,942		317,389	$3.15	94	249	23,441	13.54
Haskell	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Le Flore	6,626	4,608		11,234	7.17	27	88	2,365	4.75
McIntosh		1,313		1,313	5.28	2	96	192	6.84
Okmulgee		1,461		1,461	5.28	2	58	116	12.59
Pittsburg	42,126			42,126	13.00	109	150	16,391	2.57
Rogers	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Other counties	632,592	1,541		634,133	6.35	120	222	26,658	23.79
Total Oklahoma	967,791	39,865		1,007,656	4.63	354	195	69,163	14.57
PENNSYLVANIA									
Allegheny	2,974,423	1,339,221	122,537	4,436,181	5.38	1,456	212	308,666	14.37
Armstrong	2,489,602	1,426,262	233,891	4,149,755	3.96	1,351	189	255,118	16.27
Beaver	12,883	438,776		451,659	3.27	125	202	25,311	17.84
Bedford		317,287		317,287	3.46	137	215	29,514	10.75
Blair	6,111	6,757		12,868	4.56	16	154	2,471	5.21
Bradford	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Butler	939,432	961,777	377	1,901,586	3.66	458	217	99,252	19.16
Cambria	5,997,954	794,955	161,575	6,954,484	5.40	3,646	184	671,180	10.36
Cameron	5,087	62,904	50	68,041	3.89	14	295	4,124	16.50
Centre	439,271	320,216		759,487	3.35	266	241	64,101	11.85
Clarion	2,656,154	1,045,029	9,887	3,711,070	3.43	705	278	195,941	18.94
Clearfield	6,056,556	828,406	5,493	6,890,455	3.64	2,121	219	463,971	14.85
Clinton	390,904	90,431		481,335	3.30	81	234	18,976	25.37
Elk	307,960	365,193	112	673,265	3.63	213	142	47,448	14.19
Fayette	1,185,183	312,597	2,627	1,500,407	4.67	2,161	109	236,076	6.36
Greene	9,495,473	109,558	10,236	9,615,267	6.17	3,610	213	767,622	12.53
Huntingdon		52,545		52,545	3.43	41	183	7,512	6.99
Indiana	4,672,131	594,270	321,545	5,587,946	4.64	2,045	220	450,317	12.41
Jefferson	1,635,103	161,734	5,162	1,801,999	3.51	691	174	120,342	14.97
Lawrence		897,399		897,399	3.09	175	274	48,013	18.69
Lycoming		29,101		29,101	3.95	14	163	2,280	12.76
McKean	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)

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Mercer	539,517	442,290	283	982,090	3.79	183	289	53,029	18.52
Somerset	2,582,977	531,725	5,256	3,119,958	3.81	1,261	180	227,151	13.74
Tioga	68,438	317,274		385,712	4.48	88	249	21,914	17.60
Venango	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Washington	10,104,129	1,994,498	53,878	12,152,505	6.32	4,038	218	880,864	13.80
Westmoreland	2,703,860	620,996	531,963	3,856,819	4.97	1,392	208	289,350	13.33
Other counties	337,346	370,455	3,931	711,732	3.53	146	247	36,069	19.73
Total Pennsylvania	55,600,494	14,431,656	1,468,803	71,500,953	4.90	26,434	202	5,326,612	13.42
SOUTH DAKOTA (LIGNITE)									
Dewey		16,286	275	16,561	3.74	8	183	1,460	11.34
TENNESSEE									
Anderson	1,013,484	957,820	30	1,971,334	$3.83	540	186	100,258	19.66
Bledsoe	7,512	45,043		52,555	3.58	117	158	18,477	2.84
Campbell	858,307	526,503		1,384,810	3.58	597	169	100,686	13.75
Claiborne	336,794	14,639		351,433	3.46	176	164	28,851	12.18
Cumberland	16,850	17,763		34,613	2.82	55	144	7,939	4.36
Fentress	41,852	45,324		87,176	3.62	145	140	20,312	4.29
Grundy	132,129	81,091		213,220	4.65	32	282	9,039	23.59
Hamilton		48,065	25	48,090	4.13	50	121	6,071	7.92
Marion	160,421	89,370		249,791	4.16	227	129	29,262	8.54
Morgan	57,597	303,908	4,947	366,452	3.21	464	237	109,835	3.34
Overton	40,052	12,088		52,140	4.00	92	92	8,506	6.13
Pickett		1,200		1,200	3.73	8	39	313	3.83
Putnam	423,369	38,450	775	462,594	3.67	106	237	25,168	18.38
Rhea		13,386		13,386	3.39	35	93	3,257	4.11
Scott	409,499	88,438		497,937	3.49	266	136	36,174	13.77
Sequatchie	59,872	45,082		104,954	3.59	123	121	14,838	7.07
Van Buren	189,137	40,242		229,379	3.86	137	108	14,731	15.57
Total Tennessee	3,746,875	2,368,412	5,777	6,121,064	3.71	3,170	168	533,717	11.47

See footnotes at end of table.

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TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1963, by States and counties—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total					
UTAH									
Carbon	3,325,050	153,006	14,894	3,492,950	$5.38	1,346	185	248,963	14.03
Emery	583,151	167,548	929	751,628	4.47	184	200	36,772	20.44
Iron		48,261		48,261	4.74	20	260	5,206	9.27
Kane		1,260		1,260	5.05	1	176	176	7.16
Sevier		47,495		47,495	6.08	8	221	1,770	26.83
Summit		17,937		17,937	4.55	10	244	2,440	7.35
Total Utah	3,908,201	435,507	15,823	4,359,531	5.22	1,569	188	295,327	14.76
VIRGINIA									
Buchanan	11,008,365	2,131,604	636	13,140,605	3.85	6,751	202	1,368,989	9.60
Dickenson	8,111,406	145,455	18	8,256,879	3.97	2,072	228	472,071	17.49
Lee	430,093	71,599	200	501,892	4.11	485	175	84,644	5.93
Montgomery		13,530		13,530	3.31	15	228	3,425	3.95
Russell	1,547,093	356,782		1,903,875	4.63	652	231	150,589	12.64
Scott		3,156		3,156	3.51	13	88	1,145	2.76
Tazewell	400,390	68,469		468,859	3.26	215	226	48,630	9.64
Wise	5,058,636	980,171	203,392	6,242,199	4.06	2,155	199	429,676	14.53
Total Virginia	26,555,983	3,770,766	204,246	30,530,995	3.96	12,358	207	2,559,169	11.93
WASHINGTON									
King	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Kittitas	116,168	8,860	4,788	129,816	6.71	131	208	27,217	4.77
Lewis	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Thurston		7,865		7,865	7.00	5	264	1,322	5.95
Other counties	22,031	30,513		52,544	8.66	65	148	9,615	5.46
Total Washington	138,199	47,238	4,788	190,225	7.26	201	190	38,154	4.99

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Barbour	2,963,903	9,638	71	2,973,612	4.08	1,053	178	187,056	15.90
Boone	7,213,701	191,735	13,318	7,418,754	4.38	2,054	218	448,159	16.55
Braxton	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Brooke	133,514	337,026	396,971	867,511	3.45	257	225	57,827	15.00
Clay	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Fayette	5,038,086	346,377	12,244	5,396,707	4.49	2,831	182	514,535	10.49
Gilmer	1,111,649			1,111,649	4.15	326	219	71,263	15.60
Grant	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Greenbrier	598,656	27,557	493	626,706	3.81	437	187	81,727	7.67
Harrison	7,006,227	115,716	2,963	7,124,906	4.10	2,028	203	412,604	17.27
Kanawha	10,959,037	250,845	3,594	11,213,476	3.97	3,282	191	626,819	17.89
Lewis	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Lincoln	11,765			11,765	2.42	14	74	1,030	11.42
Logan	16,240,931	26,324	8,065	16,275,320	4.42	4,167	226	942,489	17.27
Marion	9,082,167	30,219	6,740	9,119,126	5.23	2,586	208	537,691	16.96
Marshall	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Mason	299,488	137,565		437,053	3.31	218	174	38,005	11.50
McDowell	15,477,346	480,016	109,160	16,066,522	6.20	5,692	213	1,213,996	13.23
Mercer	1,327,387	34,519	3,844	1,365,750	5.95	610	181	110,396	12.37
Mineral	65,515	7,755	4	73,274	3.67	47	201	9,443	7.76
Mingo	5,347,506	238,585	51,600	5,637,691	4.98	2,095	187	392,649	14.36
Monongalia	7,394,552	164,707		7,559,259	4.73	1,317	256	336,692	22.45
Nicholas	6,491,966	71,945	2,888	6,566,799	4.74	2,646	197	522,125	12.58
Ohio	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Pocahontas	147,913	8,022		155,935	3.61	114	178	20,342	7.67
Preston	2,710,602	757,806	145	3,468,553	3.53	1,536	212	325,156	10.67
Putnam		46,579		46,579	4.33	46	157	7,225	6.45
Raleigh	7,267,339	327,506	33,329	7,628,174	5.31	3,248	208	675,476	11.29
Randolph	953,240	73,750	500	1,027,490	4.32	645	181	116,787	8.80
Taylor	399,316	18,106	3,636	421,058	3.21	220	120	26,339	15.99
Tucker	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Upshur	762,693	21,862		784,555	4.17	374	167	62,565	12.54
Wayne	53,133	16,130		69,263	4.49	117	185	21,713	3.19
Webster	1,096,113	51,850	2,928	1,150,891	4.32	631	178	112,233	10.25
Wyoming	12,084,972	287,508	25,322	12,397,802	5.36	4,519	215	970,470	12.78
Other counties	3,542,211	169,404	1,859,968	5,571,583	4.27	1,424	238	338,236	16.47
Total West Virginia	125,780,928	4,249,052	2,537,783	132,567,763	4.79	44,534	206	9,181,048	14.44

See footnotes at end of table.

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TABLE 60.—Production, value, men working daily, days active, man-days, and output per man per day at bituminous coal and lignite mines in the United States, 1963, by States and counties—Continued

County	Production (net tons)				Average value per ton [3]	Average number of men working daily	Average number of days worked	Number of man-days worked	Average tons per man per day [4]
	Shipped by rail or water [1]	Shipped by truck	Used at mine [2]	Total					
WYOMING									
Campbell	396,153	19,684	80,049	495,886	$1.31	34	262	8,914	55.63
Carbon	531,000		21	531,021	3.96	87	158	13,711	38.73
Converse	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Hot Springs	2,758	6,224		8,982	9.46	14	144	2,009	4.47
Lincoln	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Sheridan	361,223	14,600		375,823	3.32	36	237	8,541	44.00
Sweetwater	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Other counties	283,164	1,033,943	395,286	1,712,393	3.41	229	158	36,083	47.46
Total Wyoming	1,574,298	1,074,451	475,356	3,124,105	3.18	400	173	69,258	45.11
UNITED STATES									
Total United States	384,652,627	60,901,440	13,374,108	458,928,175	4.39	141,646	205	28,996,213	15.83

[1] Includes coal loaded at mine directly into railroad cars or river barges, hauled by trucks to railroad sidings, and hauled by trucks to waterways.

[2] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

[3] Value received or charged for coal f.o.b. mine. Includes a value for coal not sold but used by producers, such as mine fuel and coal coked, as estimated by producers at average prices that might have been received if such coal had been sold commercially.

[4] In certain counties the average tons per man per day is large because of auger mining, strip mining, or mechanical loading underground.

[5] Included in "Other counties" to avoid disclosing individual operations.

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TRANSPORTATION

Within recent years, methods of shipping bituminous coal and lignite from the mines have changed radically; shipments by rail have declined, and shipments by water and truck have increased. Usually, shipments by water or truck (particularly for short distances) cost less than rail freight rates. See figure 13.

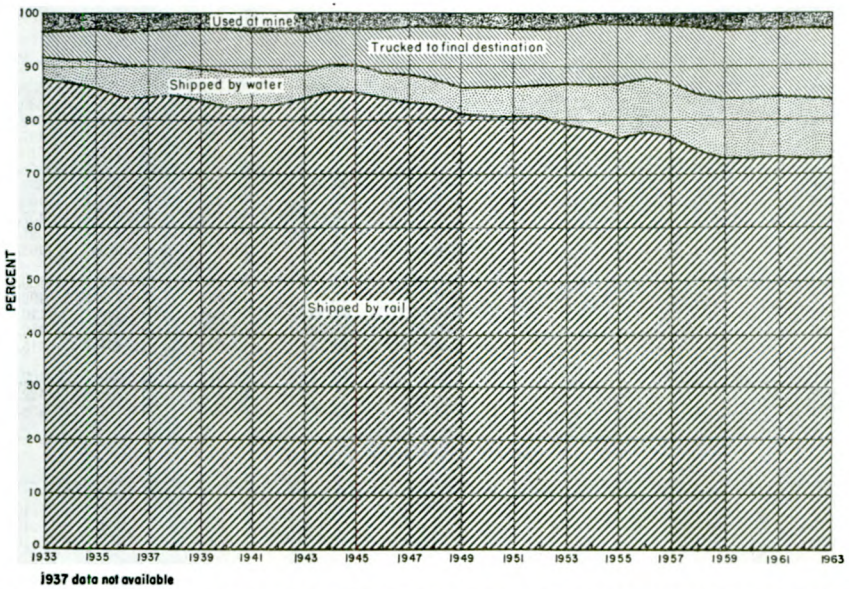

FIGURE 13.—Percentage of total production of bituminous coal and lignite, 1933–63, by method of shipment from mines, and percentage used at mines.

TABLE 61.—Bituminous coal and lignite shipped from mines, by method of shipment, and that used at mines in the United States

Year	Method of shipment from mines			Used at mine [1]	Total production
	Shipped by rail and trucked to rail	Shipped by water and trucked to water	Trucked to final destination		
	THOUSAND NET TONS				
1933	293, 258	13, 021	15, 463	11, 888	333, 630
1934	313, 304	15, 128	18, 739	12, 197	359, 368
1935	319, 742	18, 327	21, 960	12, 344	372, 373
1936	370, 763	24, 868	27, 929	15, 528	439, 088
1937	295, 336	16, 903	25, 592	10, 714	348, 545
1938	(2)	(2)	(2)	(2)	445, 531
1939	331, 190	22, 229	29, 534	11, 902	394, 855
1940	380, 388	29, 493	35, 540	15, 350	460, 771
1941	425, 184	30, 240	40, 056	18, 669	514, 149
1942	482, 814	34, 018	45, 154	20, 707	582, 693
1943	495, 863	30, 188	42, 433	21, 693	590, 177
1944	527, 136	31, 518	40, 123	20, 799	619, 576
1945	490, 472	27, 548	41, 477	18, 120	577, 617

See footnotes at end of table.

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TABLE 61.—Bituminous coal and lignite shipped from mines, by method of shipment, and that used at mines in the United States—Continued

Year	Method of shipment from mines			Used at mine [1]	Total production
	Shipped by rail and trucked to rail	Shipped by water and trucked to water	Trucked to final destination		
	THOUSAND NET TONS—Continued				
1946	450,615	24,642	42,731	15,934	533,922
1947	527,282	29,803	55,859	17,680	630,624
1948	498,194	26,735	58,260	16,329	599,518
1949	356,602	21,829	47,786	11,651	437,868
1950	417,225	27,583	58,286	13,217	516,311
1951	430,387	29,984	58,132	15,162	533,665
1952	375,911	27,746	50,231	12,953	466,841
1953	362,133	35,648	47,102	12,407	457,290
1954	305,918	32,912	44,689	8,187	391,706
1955	355,924	47,476	51,607	9,626	464,633
1956	390,015	50,732	49,768	10,359	500,874
1957	380,471	51,171	50,334	10,728	492,704
1958	305,642	43,899	50,605	10,300	410,446
1959	300,763	45,954	52,564	12,747	412,028
1960	303,865	46,784	52,699	12,164	415,512
1961	293,546	46,348	51,044	12,039	402,977
1962	307,328	48,106	54,853	11,862	422,149
1963	333,989	50,664	60,901	13,374	458,928
	PERCENTAGE OF TOTAL				
1933	87.9	3.9	4.6	3.6	100.0
1934	87.2	4.2	5.2	3.4	100.0
1935	85.9	4.9	5.9	3.3	100.0
1936	84.4	5.7	6.4	3.5	100.0
1937	[2]	[2]	[2]	[2]	100.0
1938	84.7	4.9	7.3	3.1	100.0
1939	83.9	5.6	7.5	3.0	100.0
1940	82.6	6.4	7.7	3.3	100.0
1941	82.7	5.9	7.8	3.6	100.0
1942	82.9	5.8	7.7	3.6	100.0
1943	84.0	5.1	7.2	3.7	100.0
1944	85.1	5.1	6.5	3.3	100.0
1945	84.9	4.8	7.2	3.1	100.0
1946	84.4	4.6	8.0	3.0	100.0
1947	83.6	4.7	8.9	2.8	100.0
1948	83.1	4.5	9.7	2.7	100.0
1949	81.4	5.0	10.9	2.7	100.0
1950	80.8	5.3	11.3	2.6	100.0
1951	80.7	5.6	10.9	2.8	100.0
1952	80.5	5.9	10.8	2.8	100.0
1953	79.2	7.8	10.3	2.7	100.0
1954	78.1	8.4	11.4	2.1	100.0
1955	76.6	10.2	11.1	2.1	100.0
1956	77.9	10.1	9.9	2.1	100.0
1957	77.2	10.4	10.2	2.2	100.0
1958	74.5	10.7	12.3	2.5	100.0
1959	73.0	11.1	12.8	3.1	100.0
1960	73.1	11.3	12.7	2.9	100.0
1961	72.9	11.5	12.6	3.0	100.0
1962	72.8	11.4	13.0	2.8	100.0
1963	72.8	11.0	13.3	2.9	100.0

[1] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.
[2] Data not available.

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TABLE 62.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States, 1963, as reported by mine operators

Route	State	By State (net tons)	Total for route (net tons)
RAILROAD			
Alaska	Alaska	831,807	831,807
Atchison, Topeka & Santa Fe	Colorado	4,731	823,130
	Illinois	102,625	
	New Mexico	715,774	
Baltimore & Ohio	Illinois	339,985	36,730,390
	Indiana	4,900	
	Ohio	3,787,564	
	Pennsylvania	4,896,088	
	West Virginia	27,701,853	
Bessemer & Lake Erie	Pennsylvania	1,296,176	1,296,176
Cambria & Indiana	do	1,756,942	1,756,942
Carbon County	Utah	1,132,062	1,132,062
Chesapeake & Ohio	Kentucky	11,115,585	48,341,735
	Ohio	12,578	
	Virginia	4,508	
	West Virginia	37,209,064	
Cheswick & Harmar	Pennsylvania	381,441	381,441
Chicago, Burlington & Quincy	Illinois	7,718,939	9,305,895
	Iowa	297,033	
	Missouri	529,789	
	Wyoming	760,134	
Chicago & Eastern Illinois	Illinois	1,487,262	2,996,604
	Indiana	1,509,342	
Chicago & Illinois Midland	Illinois	5,152,765	5,152,765
Chicago, Milwaukee, St. Paul & Pacific	Indiana	1,626,030	1,809,931
	Montana (bituminous)	526	
	Noth Dakota (lignite)	183,375	
Chicago & North Western	Illinois	1,731,771	1,824,643
	Iowa	92,872	
Chicago, Rock Island & Pacific	Illinois	1,150,967	1,373,002
	Iowa	216,035	
	Missouri	6,000	
Clinchfield	Kentucky	253,859	3,470,834
	Virginia	3,216,975	
Colorado & Wyoming	do	748,600	748,600
Denver & Rio Grande Western	do	1,510,205	3,645,996
	New Mexico	1,684	
	Utah	2,134,107	
Detroit, Toledo & Ironton	Ohio	5,000	5,000
Erie-Lackawanna	do	69,519	150,732
	Pennsylvania	81,213	
Great Northern	North Dakota (lignite)	436,586	436,586
Gulf, Mobile & Ohio	Illinois	568,844	568,844
Illinois Central	do	12,395,639	26,152,294
	Indiana	54,946	
	Kentucky	13,701,709	
Illinois Terminal	Illinois	237,604	237,604
Interstate	Virginia	3,246,345	3,246,345
Johnstown and Stony Creek	Pennsylvania	61,608	61,608
Kansas City Southern	Oklahoma	133,518	133,518
Kentucky & Tennessee	Kentucky	307,627	307,627
Lake Erie, Franklin & Clarion	Pennsylvania	421,853	421,853
Louisville & Nashville	Alabama	1,528,152	25,809,608
	Kentucky	23,608,925	
	Tennessee	646,987	
	Virginia	25,544	
Mary Lee	Alabama	776,044	776,044
Midland Valley	Oklahoma	259,308	259,308
Missouri-Illinois	Illinois	787,768	787,76
Missouri-Kansas-Texas	Kansas	528,268	1,435,606
	Missouri	865,212	
	Oklahoma	42,126	
Missouri Pacific	Arkansas	195,103	5,247,701
	Illinois	4,939,714	
	Missouri	18,949	
	Oklahoma	93,935	
Monon	Indiana	114,388	114,388

See footnote at end of table.

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TABLE 62.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States, 1963, as reported by mine operators—Continued

Route	State	By State (net tons)	Total for route (net tons)
RAILROAD—continued			
Monongahela	Pennsylvania	1,115,447	5,921,301
	West Virginia	4,805,854	
Montour	Pennsylvania	1,124,083	1,124,083
New York Central (includes coal shipped over Kanawha & Michigan, Kelley's Creek, Toledo & Ohio Central, and Zanesville & Western)	Illinois	5,686,389	23,851,617
	Indiana	5,613,157	
	Ohio	2,879,164	
	Pennsylvania	5,498,353	
	West Virginia	4,174,554	
New York, Chicago & St. Louis	Ohio	5,922,329	5,922,329
Norfolk & Western	Kentucky	4,466,646	61,401,968
	Virginia	19,644,166	
	West Virginia	37,291,156	
Northern Pacific	Montana (bit. & lig.)	288,899	1,356,038
	North Dakota (lignite)	950,971	
	Washington	116,168	
Pacific Coast	do.	22,031	22,031
Pennsylvania	Indiana	1,414,232	22,923,911
	Ohio	3,202,949	
	Pennsylvania	18,207,278	
	West Virginia	99,452	
Pittsburg & Shawmut	Pennsylvania	2,241,623	2,241,623
Pittsburgh & Lake Erie	do.	920,377	920,377
Pittsburgh & West Virginia	Ohio	813,722	813,722
St. Louis-San Francisco	Alabama	774,532	1,599,451
	Arkansas	17,823	
	Kansas	368,192	
	Oklahoma	438,904	
Soo Line	North Dakota (lignite)	237,023	237,023
Southern	Alabama	2,688,703	5,454,619
	Indiana	134,679	
	Kentucky	828,524	
	Tennessee	1,384,268	
	Virginia	418,445	
Southern Iowa	Iowa	1,743	1,743
Tennessee	Tennessee	1,095,112	1,095,112
Tennessee Central	do.	522,123	522,123
Tennessee Coal, Iron & Railroad Co	Alabama	2,063,205	2,063,205
Toledo, Peoria & Western	Illinois	484,232	484,232
Union Pacific	Colorado	473,540	1,287,704
	Wyoming	814,164	
Utah	Utah	642,032	642,032
Wabash	Iowa	270,893	817,065
	Missouri	546,172	
Western Allegheny	Pennsylvania	93,460	93,460
Western Maryland	Maryland	631,705	4,401,052
	Pennsylvania	473,893	
	West Virginia	3,295,454	
Woodward Iron Company	Alabama	950,071	950,071
Youngstown & Southern	Ohio	66,272	66,272
Total railroad shipments		333,988,551	333,988,551
WATERWAY			
Allegheny River	Pennsylvania	1,645,049	1,645,049
Black Warrior River	Alabama	1,653,587	1,653,587
Green River	Kentucky	7,905,103	7,905,103
Guyandot River	West Virginia	2,345	2,345
Illinois River	Illinois	2,504,509	2,504,509
Kanawha River	West Virginia	5,124,551	5,124,551
Kentucky River	Kentucky	29,400	29,400
Monongahela River	Pennsylvania	15,385,610	20,661,290
	West Virginia	5,275,680	
Ohio River	Illinois	544,885	11,039,857
	Indiana	1,749,995	
	Kentucky	4,075,066	
	Ohio	3,868,946	
	West Virginia	800,965	

See footnote at end of table.

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TABLE 62.—Bituminous coal and lignite loaded for shipment by railroads and waterways in the United States, 1963, as reported by mine operators—Continued

Route	State	By State (net tons)	Total for route (net tons)
WATERWAY—Continued			
Tennessee River	Tennessee	98,385	98,385
Total waterway shipments		50,664,076	50,664,076
Total loaded at mines for shipment by railroads and waterways		384,652,627	384,652,627
Shipped by truck from mine to final destination		60,901,440	60,901,440
Used at mine [1]		13,374,108	13,374,108
Total production, 1963		458,928,175	458,928,175

[1] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor, tram, or pipeline.

CONSUMPTION

The statistics on consumption of bituminous coal and lignite, by major consumer classes, are based upon complete coverage of all consumers in each class except "Other manufacturing and mining industries" and "Retail deliveries to other consumers." The figures for both categories are based upon a monthly sample approximating 35 percent coverage. A new benchmark representing complete coverage for "Other manufacturing and mining industries" was established for 1954, based upon data from the Census of Manufactures and the Census of Mineral Industries. The new benchmark for "Retail deliveries to other consumers" for 1954 represents the residual tonnage not otherwise accounted for and includes some coal shipped by truck from mine to final destination.

Data for each month are determined by matching plants reporting for the latest month with identical plants reporting the preceding month, calculating the percentage change from the previous month, and applying this percentage change to the published figure for the previous month. The results have been reasonably reliable over a period of years. A detailed analysis of the establishment of the new benchmarks and the revisions in "Cement mills," "Steel and rolling mills," and "Bunker, foreign and lake vessels," is given in Bureau of Mines Weekly Coal Report 2113, March 14, 1958. The total of the classes approximates total consumption and is a much more reliable figure than "calculated" consumption based on production, imports, exports, and changes in stocks, because certain significant items of stocks are not included in yearend stocks. See figure 14.

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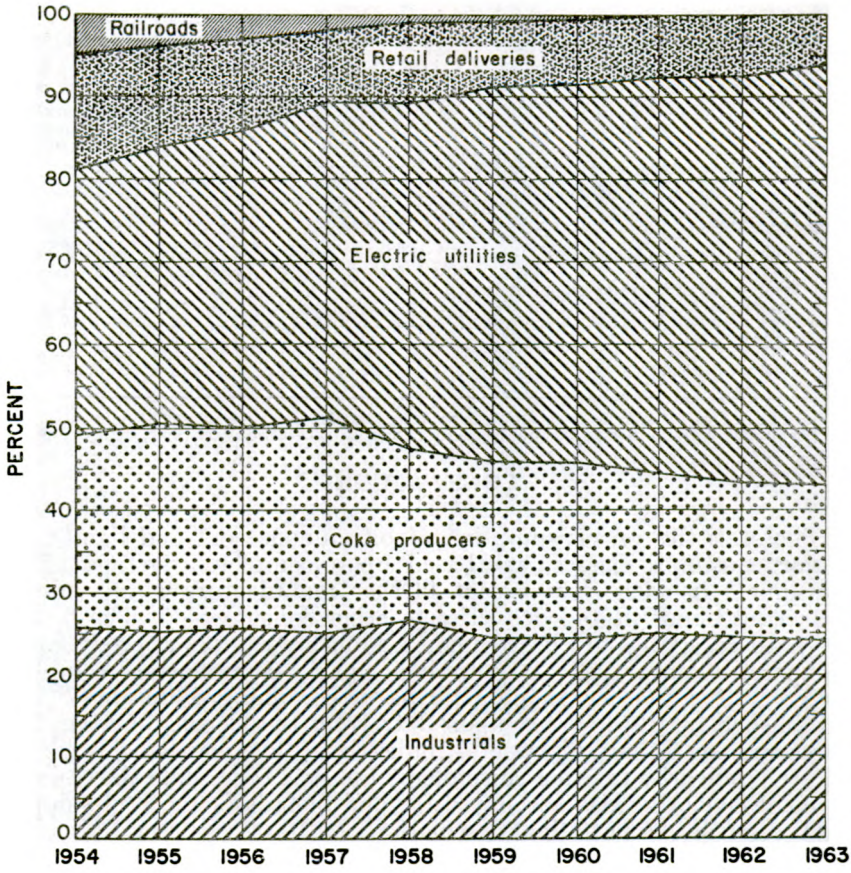

FIGURE 14.—Percentage of total consumption of bituminous coal and lignite, by consumer class, and retail deliveries in the United States, 1954–63.

TABLE 63.—Consumption of bituminous coal and lignite, by consumer class, with retail deliveries in the United States

(Thousand net tons)

Year and month	Electric power utilities [1]	Bunker, foreign and lake vessel [2]	Railroads (class I) [3]	Manufacturing and mining industries					Retail deliveries to other consumers [6]	Total of classes shown [7]
				Beehive coke plants	Oven coke plants	Steel and rolling mills [4]	Cement mills	Other manufacturing and mining industries [5]		
1933	27,088	2,298	72,548	1,408	38,681	14,129	2,760	81,377	77,396	317,685
1934	29,707	2,423	76,037	1,635	44,343	15,391	3,457	87,314	83,507	343,814
1935	30,936	2,683	77,109	1,469	49,046	16,585	3,456	94,598	80,444	356,326
1936	38,104	3,052	86,391	2,698	63,244	19,019	4,711	111,030	80,044	408,293
1937	41,045	3,433	88,080	4,927	69,575	18,148	5,182	124,056	76,331	430,777
1938	36,440	2,310	73,921	1,360	45,266	11,877	4,413	94,196	66,498	336,281
1939	42,304	2,764	79,072	2,298	61,216	13,843	5,194	100,637	68,770	376,098
1940	49,126	2,989	85,130	4,803	76,583	14,169	5,559	107,864	84,687	430,910

See footnotes at end of table.

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TABLE 63.—Consumption of bituminous coal and lignite, by consumer class, with retail deliveries in the United States—Continued

(Thousand net tons)

Year and month	Electric power utilities [1]	Bunker, foreign and lake vessel [2]	Railroads (class I) [3]	Manufacturing and mining industries					Retail deliveries to other consumers [6]	Total of classes shown [7]
				Beehive coke plants	Oven coke plants	Steel and rolling mills [4]	Cement mills	Other manufacturing and mining industries [5]		
1941	59,888	3,304	97,384	10,529	82,609	15,384	6,735	121,880	94,402	492,115
1942	63,472	3,226	115,410	12,876	87,974	14,722	7,462	132,767	102,141	540,050
1943	74,036	3,042	130,283	12,441	90,019	15,864	5,842	142,149	120,121	593,797
1944	76,656	3,069	132,049	10,858	94,438	15,152	3,767	131,498	122,112	589,599
1945	71,603	3,192	125,120	8,135	87,214	14,241	4,203	126,562	119,297	559,567
1946	68,743	2,632	110,166	7,167	76,121	12,151	6,990	117,732	98,684	500,386
1947	86,009	3,087	109,296	10,475	94,325	14,195	7,919	123,928	96,657	545,891
1948	95,620	2,552	94,838	10,322	96,984	14,193	8,546	110,060	86,794	519,909
1949	80,610	2,056	68,123	5,354	85,882	10,529	7,966	96,629	88,389	445,538
1950	88,262	2,042	60,969	9,088	94,757	10,877	7,923	95,862	84,422	454,202
1951	101,898	2,220	54,005	11,418	102,030	11,260	8,507	103,188	74,378	468,904
1952	103,309	1,839	37,962	6,912	90,702	9,632	7,903	93,637	66,861	418,757
1953	112,283	1,839	27,735	8,226	104,648	8,764	8,167	95,160	59,976	426,798
1954	115,235	1,244	17,370	980	84,411	6,983	7,924	77,115	51,798	363,060
1955	140,550	1,499	15,473	2,869	104,508	7,353	8,529	89,611	53,020	423,412
1956	154,983	1,470	12,308	4,043	101,870	7,189	9,026	93,302	48,667	432,858
1957	157,398	1,364	8,401	3,473	104,547	6,938	8,633	87,202	35,712	413,668
1958	152,928	955	3,725	1,017	75,563	7,268	8,256	81,372	35,619	366,703
1959	165,788	969	2,600	1,827	77,354	6,674	8,510	73,396	29,138	366,256
1960	173,882	945	2,101	1,640	79,375	7,378	8,216	76,487	30,405	380,429
1961	179,629	770	(8)	1,496	72,385	7,495	7,615	77,280	27,735	374,405
1962:										
January	17,723	3	(8)	172	7,469	824	587	8,068	4,593	39,439
February	15,443	-------	(8)	158	6,889	754	493	7,197	3,541	34,475
March	16,172	3	(8)	158	7,536	752	591	7,391	3,169	35,772
April	14,137	39	(8)	114	7,064	617	626	6,482	1,794	30,873
May	15,134	92	(8)	96	6,339	525	650	6,216	798	29,850
June	14,987	90	(8)	90	5,384	481	675	5,936	796	28,439
July	15,332	82	(8)	75	5,063	446	679	5,313	947	27,937
August	16,288	91	(8)	84	5,275	493	689	5,696	1,455	30,071
September	14,995	88	(8)	85	5,263	477	677	5,719	2,065	29,369
October	15,968	92	(8)	104	5,473	559	698	6,605	2,464	31,963
November	16,441	85	(8)	108	5,397	639	685	6,770	2,752	32,877
December	18,213	22	(8)	95	5,771	752	669	7,373	3,814	36,709
Total	190,833	687	(8)	1,339	72,923	7,319	7,719	78,766	28,188	387,774
1963:										
January	19,684	1	(8)	110	6,029	848	579	7,911	4,710	39,872
February	17,624	-------	(8)	112	5,637	786	516	7,254	3,928	35,857
March	17,073	1	(8)	110	6,603	743	599	7,435	2,302	34,866
April	15,378	34	(8)	144	6,763	605	617	6,729	1,011	31,281
May	15,717	99	(8)	168	7,139	574	711	6,635	830	31,873
June	16,191	81	(8)	160	6,771	511	750	6,217	703	31,384
July	17,053	72	(8)	142	6,398	469	735	5,900	841	31,610
August	17,649	85	(8)	134	5,976	447	740	6,284	1,153	32,468
September	16,566	89	(8)	134	5,905	479	716	6,171	1,536	31,596
October	17,593	98	(8)	139	6,233	518	701	7,023	1,511	33,816
November	17,783	85	(8)	128	6,108	597	719	7,058	1,905	34,383
December	20,727	25	(8)	132	6,458	824	755	8,180	3,118	40,219
Total	209,038	670	(8)	1,613	76,020	7,401	8,138	82,797	23,548	409,225

[1] Federal Power Commission.
[2] Bureau of the Census, U.S. Department of Commerce, Ore and Coal Exchange.
[3] Association of American Railroads. Represents consumption of bituminous coal and lignite for all uses, including locomotive, powerhouse, shop, and station fuel.
[4] Estimates based upon reports collected from a selected list of representative steel and rolling mills.
[5] Estimates based upon reports collected from a selected list of representative manufacturing plants.
[6] Estimates based upon reports collected from a selected list of representative retailers. Includes some coal shipped by truck from mine to final destination.
[7] The total of classes shown approximates total consumption. The calculation of consumption from production, imports, exports, and changes in stocks is not as accurate as the "Total of classes shown" because certain significant items of stocks are not included in year-end stocks. These items are: Stocks on Lake and Tidewater docks, stocks at other intermediate storage piles between mine and consumer, and coal in transit.
[8] Canvass discontinued.

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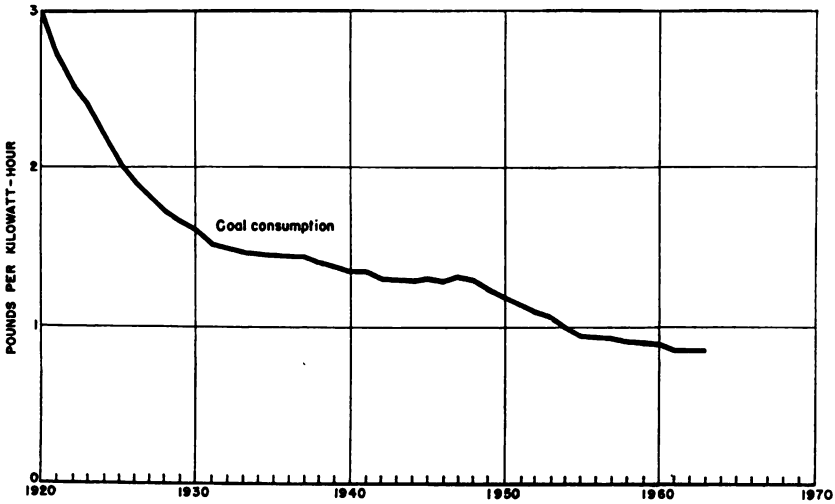

FIGURE 15.—Trend in fuel economy at electric-utility powerplants in the United States, 1920–63.

TABLE 64.—Fuel economy in consumption of coal at electric-utility powerplants in the United States

Year	Coal consumed per kilowatt-hour (pounds)	Index numbers based on 1919 as 100	Year	Coal consumed per kilowatt-hour (pounds)	Index numbers based on 1919 as 100	Year	Coal consumed per kilowatt-hour (pounds)	Index numbers based on 1919 as 100
1919	3.20	100.0	1934	1.45	45.3	1949	1.24	38.8
1920	3.00	93.8	1935	1.44	45.0	1950	1.19	37.2
1921	2.70	84.4	1936	1.44	45.0	1951	1.14	35.6
1922	2.50	78.1	1937	1.44	45.0	1952	1.10	34.4
1923	2.40	75.0	1938	1.40	43.8	1953	1.06	33.1
1924	2.20	68.8	1939	1.38	43.1	1954	.99	30.9
1925	2.00	62.5	1940	1.34	41.9	1955	.95	29.7
1926	1.90	59.4	1941	1.34	41.9	1956	.94	29.4
1927	1.82	56.9	1942	1.30	40.6	1957	.93	29.1
1928	1.73	54.1	1943	1.30	40.6	1958	.90	28.1
1929	1.66	51.9	1944	1.29	40.3	1959	.89	27.8
1930	1.60	50.0	1945	1.30	40.6	1960	.88	27.5
1931	1.52	47.5	1946	1.29	40.3	1961	.86	26.9
1932	1.49	46.6	1947	1.31	40.9	1962	.86	26.9
1933	1.46	45.6	1948	1.30	40.6	1963	.86	26.9

DISTRIBUTION OF BITUMINOUS COAL AND LIGNITE

Tables 65, 66, and 67 summarize the distribution of bituminous coal and lignite in 1963 for types of consumer use by methods of transportation, coal-producing districts of origin, as well as geographic divisions and States of destination. This information shows the participation of the bituminous coal and lignite industry in various energy markets of the Nation, both locally and nationally. It also provides benchmarks for special studies and analyses of the many factors that influence coal production and its utilization in the highly competitive energy market.

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TABLE 65.—Distribution of bituminous coal and lignite, 1963, by method of movement and consumer use

(Thousand net tons)

Shipments	Electric utilities	Coke and gas plants	Retail dealers	All others	Railroad fuel	Used at mines and sales to employees
Total shipments to all destinations in the United States, Canada, and Mexico, by all methods of movements and consumer use, and overseas exports	211,444	82,732	26,011	98,763	1,545	1,753
Shipments to all destinations in the United States, Canada, and Mexico by specific method of movement and consumer use:						
Method of movement:						
All-rail	101,239	34,838	16,926	61,258	--------	--------
River and ex-river	47,041	25,250	880	6,716	--------	--------
Great Lakes [1]	18,602	15,368	3,812	12,876	--------	--------
Tidewater [2]	15,636	5,952	183	1,812	--------	--------
Truck	16,228	632	4,210	15,860	--------	--------
Tramway, conveyor, and private railroad	12,698	692	--------	241	--------	--------
Method of movement and/or consumer uses unknown	--------	--------	--------	--------	1,545	1,753
Total	211,444	82,732	26,011	98,763	1,545	1,753

Shipments	Canadian Great Lakes commercial docks [3]	U.S. Great Lakes dock storage [3]	U.S. tidewater dock storage [3]	Overseas exports [4]	Net change in mine inventory	Total
Total shipments to all destinations in the United States, Canada, and Mexico, by all methods of movements and consumer use, and overseas exports	593	70	6	33,317	-97	456,137
Shipments to all destinations in the United States, Canada, and Mexico by specific method of movement and consumer use:						
Method of movement:						
All-rail	--------	--------	--------	--------	--------	214,261
River and ex-river	--------	--------	--------	--------	--------	79,887
Great Lakes [1]	--------	--------	--------	--------	--------	50,658
Tidewater [2]	--------	--------	--------	--------	--------	23,583
Truck	--------	--------	--------	--------	--------	36,930
Tramway, conveyor, and private railroad	--------	--------	--------	--------	--------	13,631
Method of movement and/or consumer uses unknown	593	70	6	33,317	-97	37,187
Total	593	70	6	33,317	-97	456,137

[1] Excludes shipments to Canadian Great Lakes commercial docks and U.S. dock storage for which consumer uses are not available; however, includes vessel fuel, the destinations of which are not available.
[2] Excludes overseas exports and U.S. tidewater dock storage for which consumer uses are not available; however, includes bunker fuel, the destinations of which are not available.
[3] Consumer use unknown.
[4] Excludes Canada; consumer use unknown.

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TABLE 66.—Distribution of bituminous coal and lignite, 1963, by district of origin and consumer use

(Thousand net tons)

District of origin [1]	Electric utilities	Coke and gas plants	Retail dealers	All others	Railroad fuel	Used at mines and sales to employees
1	20,230	2,333	652	8,419	185	398
2	8,882	21,101	622	7,613	15	35
3 and 6	24,952	7,067	854	7,664	123	18
4	22,708		1,955	11,602	285	68
7	1,292	15,652	2,485	3,333	82	472
8	42,948	25,298	10,351	31,113	198	592
9	30,091	29	2,256	3,983	72	
10	31,656	1,256	3,295	14,630	282	75
11	9,242		890	4,822	138	23
12	916		41	389		
13	6,973	5,312	386	879	2	1
14		611	1	54		
15 [2]	3,732	137	211	1,063	20	
16	508		74	174		6
17	1,048	1,843	321	275		7
18	1,512		9	31		1
19	2,234		158	681	94	5
20	458	2,093	944	840	5	19
21	1,439		413	546	38	20
22 and 23	623		93	652	6	13
Total	211,444	82,732	26,011	98,763	1,545	1,753

District of origin [1]	Canadian Great Lakes commercial docks [3]	U.S. Great Lakes dock storage [3]	U.S. tidewater dock storage [3]	Overseas exports [4]	Net change in mine inventory	Total
1	4	−11	−2	1,720	22	33,950
2		−1			201	38,468
3 and 6	174	93	10	2,107	266	43,328
4	114	−100			53	36,685
7	70	50	5	13,794	−245	36,990
8	231	50	−7	15,696	−397	126,073
9		5			172	36,608
10		−16			20	51,198
11					−79	15,036
12					14	1,360
13					−77	13,476
14						666
15 [2]					−4	5,159
16					−4	758
17					−16	3,478
18					−6	1,547
19					−5	3,167
20					−12	4,347
21					4	2,460
22 and 23					−4	1,383
Total	593	70	6	33,317	−97	456,137

[1] Producing districts are defined in: Bureau of Mines. Bituminous Coal and Lignite Distribution Calendar Year 1963. Mineral Industry Survey, March, 1964, 21 pp.
[2] Excludes Texas.
[3] Consumer use unknown.
[4] Excludes Canada; consumer use unknown.

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TABLE 67.—Distribution of bituminous coal and lignite, 1963, by destination and consumer use

(Thousand net tons)

Destination	Total	Electric utilities	Coke and gas plants	Retail dealers	All others [1]
New England:					
Massachusetts	4,346	3,433	----------	162	751
Connecticut	4,341	3,491	472	48	330
Maine, New Hampshire, Vermont, and Rhode Island	1,330	846	----------	90	394
Middle Atlantic:					
New York	22,417	11,235	4,020	373	6,789
New Jersey	6,874	4,930	397	58	1,489
Pennsylvania	50,201	18,135	21,721	926	9,419
East North Central:					
Ohio	49,157	22,991	9,061	2,623	14,482
Indiana	33,124	15,359	10,697	1,739	5,329
Illinois	39,086	20,924	2,798	5,288	10,076
Michigan	29,888	13,582	4,813	2,154	9,339
Wisconsin	13,168	6,088	340	2,418	4,322
West North Central:					
Minnesota	6,143	3,199	663	675	1,606
Iowa	5,271	2,535	----------	714	2,022
Missouri	7,896	5,214	113	541	2,028
North Dakota and South Dakota	2,113	1,233	----------	524	356
Nebraska and Kansas	1,819	998	----------	148	673
South Atlantic:					
Delaware and Maryland	10,968	5,018	4,410	337	1,203
District of Columbia	718	360	----------	151	207
Virginia	13,323	7,401	50	1,042	4,830
West Virginia	16,742	7,183	4,548	284	4,727
North Carolina	11,187	7,925	----------	798	2,464
South Carolina	4,442	2,474	----------	292	1,676
Georgia and Florida	6,436	5,616	----------	299	521
East South Central:					
Kentucky	15,453	10,436	1,877	795	2,345
Tennessee	14,952	11,796	218	869	2,069
Alabama and Mississippi	17,013	10,204	5,546	335	928
West South Central: Arkansas, Louisiana, Oklahoma, and Texas	802	17	616	37	132
Mountain:					
Colorado	3,752	1,816	1,134	286	516
Utah	2,334	436	1,331	244	323
Montana and Idaho	1,066	287	----------	479	300
Wyoming	1,977	1,769	----------	53	155
New Mexico	1,132	1,085	----------	22	25
Arizona and Nevada	562	439	----------	38	85
Pacific:					
Washington and Oregon	828	----------	----------	269	559
California	1,690	----------	1,653	4	33
Alaska	855	336	----------	53	466
Canada [2]	13,038	2,483	5,652	811	4,092
Mexico	48	----------	----------	----------	48
Destinations not revealable	1,350	170	602	32	546
Destinations and/or consumer uses not available:					
Great Lakes movement:					
Canadian commercial docks	593	----------	----------	----------	----------
Vessel fuel	1,090	----------	----------	----------	----------
U.S. dock storage	70	----------	----------	----------	----------
Tidewater movement:					
Overseas exports (except Canada)	33,317	----------	----------	----------	----------
Bunker fuel	18	----------	----------	----------	----------
U.S. dock storage	6	----------	----------	----------	----------
Railroad fuel					
U.S. companies	1,452	----------	----------	----------	----------
Canadian companies	93	----------	----------	----------	----------
Coal used at mines and sales to employees	1,753	----------	----------	----------	----------
Net change in mine inventory	−97	----------	----------	----------	----------
Total	456,137	----------	----------	----------	----------

[1] Excludes vessel and bunker fuel, the destinations of which are not available.
[2] Excludes shipments to Canadian Great Lakes commercial docks and Canadian railroad companies.

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TABLE 68.—Total bituminous coal and lignite shipments and percent of grand total shipments, 1958–1963, by geographic division and State of destination

Geographic division and State of destination	Thousand tons						Percent of total					
	1958	1959	1960	1961	1962	1963	1958	1959	1960	1961	1962	1963
Total	408,564	412,245	416,119	403,262	424,627	456,137	100.0	100.0	100.0	100.0	100.0	100.0
New England	10,871	11,150	9,313	9,674	9,997	10,017	2.7	2.7	2.2	2.4	2.4	2.2
Massachusetts	4,728	4,924	4,031	4,014	4,342	4,346	1.2	1.2	1.0	1.0	1.0	1.0
Connecticut	4,199	3,850	3,758	3,956	4,047	4,341	1.0	0.9	0.9	1.0	1.0	0.9
Maine, New Hampshire, Vermont, and Rhode Island	1,944	2,376	1,524	1,704	1,608	1,330	0.5	0.6	0.3	0.4	0.4	0.3
Middle Atlantic	74,836	75,082	76,173	72,076	76,107	79,492	18.3	18.2	18.3	17.9	17.9	17.4
New York	23,605	22,974	22,980	21,092	21,737	22,417	5.8	5.6	5.5	5.2	5.1	4.9
New Jersey	6,391	6,087	5,910	6,455	6,901	6,874	1.5	1.5	1.4	1.6	1.6	1.5
Pennsylvania	44,840	46,021	47,283	44,529	47,469	50,201	11.0	11.1	11.4	11.1	11.2	11.0
East North Central	[1] 147,224	161,242	158,125	151,278	159,391	164,423	[1] 36.1	39.1	38.0	37.5	37.5	36.0
Ohio	[2] 44,390	[2] 50,071	49,624	44,998	48,324	49,157	[2] 10.9	[2] 12.2	11.9	11.2	11.4	10.8
Indiana	[2] 31,322	[2] 31,000	32,283	31,894	31,824	33,124	[2] 7.7	[2] 7.5	7.8	7.9	7.5	7.2
Illinois	38,806	39,720	38,705	37,479	39,259	39,086	9.5	9.6	9.3	9.3	9.2	8.6
Michigan	[1] 22,384	27,231	25,076	24,327	27,255	29,888	[1] 5.5	6.6	6.0	6.0	6.4	6.5
Wisconsin	10,322	13,220	12,437	12,580	12,729	13,168	2.5	3.2	3.0	3.1	3.0	2.9
West North Central	19,702	21,023	22,571	20,920	22,520	23,242	4.8	5.1	5.4	5.2	5.3	5.1
Minnesota	4,848	5,378	6,375	5,891	5,768	6,143	1.2	1.3	1.5	1.5	1.4	1.3
Iowa	4,869	5,062	4,946	4,439	5,047	5,271	1.2	1.2	1.2	1.1	1.2	1.2
Missouri	6,462	6,944	7,279	6,847	7,685	7,896	1.6	1.7	1.7	1.7	1.8	1.7
North Dakota and South Dakota	2,363	2,434	2,453	2,425	2,390	2,113	0.5	0.6	0.6	0.6	0.5	0.5
Nebraska and Kansas	1,160	1,205	1,518	1,318	1,630	1,819	0.3	0.3	0.4	0.3	0.4	0.4
South Atlantic	49,789	50,682	52,547	55,316	57,891	63,816	12.2	12.3	12.6	13.7	13.6	14.0
Delaware and Maryland	8,591	8,122	9,031	9,351	9,884	10,968	2.1	2.0	2.2	2.3	2.3	2.4
District of Columbia	1,060	1,105	1,002	968	813	718	0.3	0.3	0.2	0.2	0.2	0.2
Virginia	11,185	11,147	11,685	12,343	12,823	13,323	2.7	2.7	2.8	3.1	3.0	2.9
West Virginia	14,323	14,143	13,778	14,661	15,272	16,742	3.5	3.4	3.3	3.6	3.6	3.7
North Carolina	8,048	8,946	8,667	9,295	9,980	11,187	2.0	2.2	2.1	2.3	2.4	2.4
South Carolina	3,108	3,444	3,591	3,800	3,921	4,442	0.8	0.8	0.9	1.0	0.9	1.0
Georgia and Florida	3,474	3,775	4,793	4,898	5,198	6,436	0.8	0.9	1.1	1.2	1.2	1.4
East South Central	36,479	38,907	41,556	40,771	42,709	47,418	8.9	9.4	10.0	10.1	10.0	10.4
Kentucky	[3] 11,597	11,301	11,270	11,340	11,873	15,453	[3] 2.8	2.7	2.7	2.8	2.8	3.4
Tennessee	[3] 12,315	[4] 13,744	14,786	13,588	14,120	14,952	[3] 3.0	[4] 3.3	3.6	3.4	3.3	3.3
Alabama and Mississippi	12,567	[4] 13,862	15,500	15,843	16,716	17,013	3.1	[4] 3.4	3.7	3.9	3.9	3.7

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West South Central: Arkansas, Louisiana, Oklahoma, and Texas	1,599	1,387	1,114	802	839	802	0.4	0.3	0.3	0.2	0.2	0.2
Mountain	7,362	7,346	8,536	8,932	8,898	10,823	1.8	1.8	2.1	2.2	2.1	2.4
Colorado	2,738	2,781	2,887	3,242	3,340	3,752	0.7	0.7	0.7	0.8	0.8	0.8
Utah	3,003	2,508	3,377	3,046	2,417	2,334	0.8	0.6	0.8	0.8	0.6	0.5
Montana and Idaho	881	941	952	1,045	1,108	1,066	0.2	0.3	0.2	0.3	0.3	0.3
Wyoming	510	894	1,006	1,328	1,438	1,977	0.1	0.2	0.3	0.3	0.3	0.4
New Mexico	98	113	171	138	107	1,132	(5)	(5)	0.1	(5)	(5)	0.3
Arizona and Nevada	132	109	143	133	488	562	(5)	(5)	(5)	(5)	0.1	0.1
Pacific	2,243	2,394	2,271	3,162	2,390	2,518	0.5	0.6	0.6	0.8	0.6	0.6
Washington and Oregon	958	897	953	992	964	828	0.2	0.2	0.3	0.3	0.2	0.2
California	1,285	1,497	1,318	2,170	1,426	1,690	0.3	0.4	0.3	0.5	0.4	0.4
Alaska	775	685	720	710	893	855	0.2	0.2	0.2	0.2	0.2	0.2
Canada [6]	[1] 11,980	12,381	11,413	11,166	11,702	13,724	[1] 2.9	3.0	2.7	2.8	2.8	3.0
Mexico	(7)	54	57	55	53	48	(7)	(5)	(5)	(5)	(5)	(5)
Destinations not revealable			1,380	1,148	1,105	1,350			0.3	0.3	0.2	0.3
U.S. railroad fuel	3,395	2,513	2,124	1,782	1,602	1,452	0.8	0.6	0.5	0.4	0.4	0.3
U.S. Great Lakes dock storage	1,436	304	363	−718	−29	70	0.4	0.1	0.1	−0.2	(5)	(5)
U.S. tidewater dock storage	10	26		19		6	(5)	(5)		(5)		(5)
Vessel fuel	1,267	1,544	1,419	1,083	1,183	1,090	0.3	0.4	0.3	0.3	0.3	0.2
Bunker fuel	27	17	4	3	12	18	(5)	(5)	(5)	(5)	(5)	(5)
Overseas exports	37,744	24,835	24,818	23,780	27,041	33,317	9.2	6.0	6.0	5.9	6.4	7.3
Coal used at mines and sales to employees	2,294	1,907	1,676	1,366	1,272	1,753	0.6	0.5	0.4	0.3	0.3	0.4
Net change in mine inventory	−469	−1,234	−61	−63	−949	−97	−0.1	−0.3	(5)	(5)	−0.2	(5)

[1] District 2 shipments in first quarter 1958 to Michigan included with Canada.
[2] District 9 shipments via river and ex-river to Ohio electric utilities included with Indiana.
[3] District 10 shipments in second, third, and fourth quarters 1958 to Tennessee included with Kentucky.
[4] District 10 shipments via river and ex-river to Alabama and Mississippi electric utilities included with Tennessee.
[5] Less than one-tenth of one percent.
[6] Includes shipments to Canadian Great Lakes commercial docks and Canadian railroad companies.
[7] Not available.

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Table 69 shows, on a comparative basis, the total tons shipped to all types of consumers during the years 1958 through 1963 and what percentage of total shipments during each year moved to each geographic region and State. From these data one can readily determine the size of the total market, the relative position of regional and State markets in relation to the whole, and the trend of shipments to these markets from year to year. The regional and State data reported in this table exclude shipments for United States railroad fuel, vessel fuel, bunker fuel, coal used at mines and sales to employees, overseas exports, and net change in mine inventory because the utlimate destinations of these tonnages are not available. Accordingly, this information, where available, is shown in totals at the end of the table.

Table 69 shows the quantitative changes in total tons shipped, expressed in indexes, that took place throughout the country, by geographic division, State of destination, and consumer use, for the years 1957 and 1959 through 1963. The year 1957 is used as the base year, representing 100. For example, the total shipments of bituminous coal and lignite in the United States in 1957 amounted to 493,895,000 tons. This sum represents 100. Total shipments in 1960 represented only 84.3 percent of the 1957 level, while in 1961 total shipments, compared with 1957 figures, amounted to 81.6 percent. In 1963 they represented 92.4 percent.

To indicate the size of the bituminous coal and lignite market, quantitatively, in each geographic division, State, and consumer use category, the 1957 total tons shipped are shown in the table in lieu of the index numbers of 100 which each tonnage figure represents (except those otherwise noted).

These distribution data are based on reports submitted to the Bureau of Mines voluntarily by producers, sales agents, distributors, and wholesalers who normally produce or sell 100,000 tons or more annually. The unprecedented cooperation of these respondents resulted in their reporting about 94 percent of all coal produced or shipped. To account for total industry shipments, estimates for the remaining shipments are included, based on data from coal trade and other reliable coal statistical reporting agencies.

Details of the bituminous coal and lignite distribution for 1963 are presented in a Bureau of Mines report.[5]

[5] Bureau of Mines. Bituminous Coal and Lignite Distribution Calendar Year 1963. Mineral Industry Surveys, March 1964, 21 pp.

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TABLE 69.—The changing levels of bituminous coal and lignite markets—indexes of physical volumes shipped to markets, 1957 and 1959–1963, by geographic division, State of destination, and consumer use

Geographic division, State of destination, and consumer use	1957 (thousand tons)	Index 1957 = 100 (except where noted)				
		1959	1960	1961	1962	1963
Total	493,895	83.5	84.3	81.6	86.0	92.4
Electric utilities	160,754	104.1	108.4	110.1	120.4	131.5
Coke and gas plants	112,901	73.8	76.3	69.8	68.6	73.3
Retail dealers	39,230	86.2	82.0	74.7	73.0	66.3
All others (includes vessel and bunker fuel)	108,711	89.6	85.4	83.4	87.6	90.8
Railroad fuel (U.S. and Canada)	9,581	30.2	23.5	19.6	18.0	16.1
Canadian Great Lake commercial docks (consumer use not available)	2,785	57.9	61.6	43.6	26.1	21.3
U.S. Great Lakes dock storage (consumer use not available)	(1)	(1)	(1)	(1)	(1)	(1)
U.S. tidewater dock storage (consumer use not available)	(1)	(1)	(1)	(1)	(1)	(1)
Coal used at mines and sales to employees	3,125	61.0	53.6	43.7	40.7	56.1
Net change in inventory	1,142	−208.1	−105.3	−105.5	−183.1	−108.5
Overseas exports (excludes Canada—consumer use not available)	55,666	44.6	44.6	42.7	48.6	59.9
New England	11,909	93.6	78.2	81.2	83.9	84.1
Electric utilities	6,012	105.4	99.8	111.8	120.2	129.2
Coke and gas plants	1,345	81.0	42.4	35.3	35.3	35.1
Retail dealers	1,279	43.6	48.7	35.4	35.2	23.5
All others	3,273	96.7	64.8	61.8	57.0	45.1
Massachusetts	5,354	92.0	75.3	75.0	81.1	81.2
Electric utilities	2,575	103.8	94.0	103.8	119.1	133.3
Coke and gas plants	751	69.9	14.2	.0	.0	.0
Retail dealers	755	38.7	55.2	36.7	38.3	21.5
All others	1,273	112.7	85.4	83.7	77.5	59.0
Connecticut	4,105	93.8	91.5	96.4	98.6	105.7
Electric utilities	2,567	99.6	110.2	121.1	127.2	136.0
Coke and gas plants	594	95.1	77.8	80.0	75.3	79.5
Retail dealers	139	47.5	61.9	44.6	46.8	34.5
All others	805	82.1	47.3	38.5	33.5	41.0
Maine, New Hampshire, Vermont, and Rhode Island	2,450	97.0	62.2	69.6	65.6	54.3
Electric utilities	870	127.1	86.3	108.3	102.6	97.2
Retail dealers	385	51.9	31.2	29.6	24.9	23.4
All others	1,195	89.5	54.6	54.2	51.0	33.0
Middle Atlantic	92,596	81.1	82.3	77.8	82.2	85.8
Electric utilities	31,662	94.1	96.7	97.2	104.5	108.3
Coke and gas plants	38,448	66.6	70.0	61.8	62.5	68.0
Retail dealers	2,498	75.4	71.3	65.7	61.6	54.3
All others	19,988	89.0	84.4	79.6	87.2	88.5
New York	26,753	85.9	85.9	78.8	81.3	83.8
Electric utilities	12,335	90.6	93.5	85.3	88.8	91.1
Coke and gas plants	5,693	71.2	75.6	66.4	70.2	70.6
Retail dealers	769	69.7	56.0	56.6	60.7	48.5
All others	7,956	90.6	84.4	79.8	79.5	85.3
New Jersey	7,814	77.9	75.6	82.6	88.3	88.0
Electric utilities	4,284	82.6	84.9	100.9	108.6	115.1
Coke and gas plants	1,249	66.5	59.7	45.1	35.2	31.8
Retail dealers	130	76.2	51.5	51.5	37.7	44.6
All others	2,151	75.4	68.0	69.8	81.9	69.2
Pennsylvania	58,029	79.3	81.5	76.7	81.8	86.5
Electric utilities	15,043	100.3	102.7	105.8	116.3	120.6
Coke and gas plants	31,506	65.8	69.4	61.6	62.2	68.9
Retail dealers	1,599	78.0	80.2	71.2	64.0	57.9
All others	9,881	90.7	88.0	81.5	94.6	95.3
East North Central	[2] 170,697	94.5	92.6	88.6	93.4	96.3
Electric utilities	66,436	102.9	104.7	102.7	112.5	118.8
Coke and gas plants	38,757	77.7	79.2	70.0	68.4	71.5
Retail dealers	21,321	90.7	82.1	76.0	74.8	66.7
All others	[2] 44,183	98.3	91.3	90.0	95.5	98.6
Ohio	55,612	[3] 90.0	89.2	80.9	86.9	88.4
Electric utilities	20,193	[3] 101.3	105.9	100.2	108.5	113.9
Coke and gas plants	15,661	80.3	75.9	58.3	60.5	57.9
Retail dealers	5,077	78.9	68.4	57.4	61.1	51.7
All others	14,681	88.8	87.9	86.6	94.1	98.6
Indiana	34,938	[3] 88.7	92.4	91.3	91.1	94.8
Electric utilities	12,853	[3] 104.6	106.8	106.8	115.2	119.5
Coke and gas plants	13,736	69.0	80.3	78.3	69.9	77.9
Retail dealers	2,796	86.4	78.0	72.6	69.0	62.2
All others	5,553	101.9	96.5	96.9	99.0	96.0
Illinois	[2] 42,718	93.0	90.6	87.7	91.9	91.5
Electric utilities	18,584	97.2	103.0	103.2	109.7	112.6
Coke and gas plants	3,925	78.1	75.1	70.7	73.2	71.3

See footnotes at end of table.

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TABLE 69.—The changing levels of bituminous coal and lignite markets—indexes of physical volumes shipped to markets, 1957 and 1959–1963, by geographic division, State of destination, and consumer use—Continued

Geographic division, State of destination, and consumer use	1957 (thousand tons)	Index 1957 = 100 (except where noted)				
		1959	1960	1961	1962	1963
East North Central—Continued						
Illinois—Continued						
Retail dealers	8,623	84.4	76.2	66.1	67.3	61.3
All others	[3] 11,586	97.7	86.8	84.8	88.1	87.0
Michigan	26,255	103.7	95.5	92.7	103.8	113.8
Electric utilities	9,839	108.5	103.6	101.6	124.8	138.0
Coke and gas plants	4,877	92.0	92.6	84.5	87.1	98.7
Retail dealers	3,368	85.9	73.0	74.6	70.0	64.0
All others	8,171	112.3	96.8	94.2	102.5	114.3
Wisconsin	11,174	118.3	111.3	112.6	113.9	117.8
Electric utilities	4,967	115.3	103.7	101.6	108.1	122.6
Coke and gas plants	558	89.4	60.9	62.4	52.9	60.9
Retail dealers	1,457	188.2	194.2	209.0	189.8	166.0
All others	4,192	101.4	98.3	98.8	102.5	103.1
West North Central	[3] 20,824	101.0	108.4	100.5	108.1	111.6
Electric utilities	8,278	110.6	127.3	123.9	147.6	159.2
Coke and gas plants	1,518	74.5	62.3	39.0	50.6	51.1
Retail dealers	4,079	99.3	101.1	89.5	79.9	63.8
All others	[3] 6,949	96.3	100.2	92.4	90.3	96.2
Minnesota	5,332	100.9	119.6	110.5	108.2	115.2
Electric utilities	1,810	126.6	162.9	154.5	169.0	176.7
Coke and gas plants	1,206	73.2	60.6	43.2	52.4	55.0
Retail dealers	553	146.3	176.1	178.7	131.5	122.1
All others	1,763	79.1	97.7	90.0	76.7	91.1
Iowa	[3] 4,878	103.8	101.4	91.0	103.5	108.1
Electric utilities	1,846	112.7	111.6	100.6	127.1	137.3
Retail dealers	1,254	82.9	74.9	63.2	63.9	56.9
All others	[3] 1,778	109.3	109.5	100.7	106.8	113.7
Missouri	6,862	101.2	106.1	99.8	112.0	115.1
Electric utilities	2,605	118.1	138.1	142.2	176.2	200.2
Coke and gas plants	312	79.5	68.6	22.8	43.6	36.2
Retail dealers	1,495	82.9	81.8	68.3	61.7	36.2
All others	2,450	97.1	91.6	83.7	83.1	82.8
North Dakota and South Dakota	2,416	100.7	101.5	100.4	98.9	87.5
Electric utilities	1,378	87.4	91.1	99.3	103.7	89.5
Retail dealers	517	137.1	135.4	126.5	118.6	101.4
All others	521	99.8	95.4	77.2	66.8	68.3
Nebraska and Kansas	1,336	90.2	113.6	98.7	122.0	136.2
Electric utilities	639	78.1	106.3	82.6	124.3	156.2
Retail dealers	260	97.7	111.2	75.4	75.8	56.9
All others	437	103.4	125.9	135.9	146.2	154.0
South Atlantic	52,560	96.4	100.0	105.2	110.1	121.4
Electric utilities	22,251	118.3	122.1	134.0	143.6	161.7
Coke and gas plants	11,321	67.1	74.6	73.4	73.5	79.6
Retail dealers	4,765	74.7	77.9	66.3	70.0	67.2
All others	14,223	92.7	93.0	98.6	100.5	109.9
Delaware and Maryland	10,358	78.4	87.2	90.3	95.4	105.9
Electric utilities	3,000	119.7	125.4	137.6	144.2	167.3
Coke and gas plants	5,414	55.6	76.6	76.3	82.6	81.5
Retail dealers	420	105.0	55.0	51.0	56.9	80.2
All others	1,524	70.7	58.4	57.6	55.6	78.9
District of Columbia	1,097	100.7	91.3	88.2	74.1	65.5
Electric utilities	609	108.5	70.1	67.7	52.5	59.1
Retail dealers	188	80.3	73.4	77.1	78.7	80.3
All others	300	97.7	145.7	137.0	115.0	69.0
Virginia	10,553	105.6	110.7	117.0	121.5	126.2
Electric utilities	4,435	137.3	138.2	151.2	162.2	166.9
Coke and gas plants	165	24.8	101.8	46.7	19.4	30.3
Retail dealers	1,756	65.2	75.5	64.5	62.6	59.3
All others	4,197	92.2	96.7	105.5	107.1	115.1
West Virginia	15,771	89.7	87.4	93.0	96.8	106.2
Electric utilities	6,290	95.7	94.8	103.2	111.2	114.2
Coke and gas plants	5,742	79.0	71.8	71.4	66.4	79.2
Retail dealers	302	67.9	83.1	82.8	112.9	94.0
All others	3,437	98.5	100.0	111.1	119.9	137.5
North Carolina	8,716	102.6	99.4	106.6	114.5	128.4
Electric utilities	4,953	112.1	108.1	123.0	135.4	160.0
Retail dealers	1,248	78.9	82.3	66.8	70.6	63.9
All others	2,515	95.8	90.9	94.2	95.1	98.0
South Carolina	3,050	112.9	117.7	124.6	128.6	145.6
Electric utilities	856	176.1	192.5	222.8	236.8	289.0
Retail dealers	321	96.3	107.5	84.1	90.0	91.0
All others	1,873	86.9	85.3	86.7	85.7	89.5

See footnotes at end of table.

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TABLE 69.—The changing levels of bituminous coal and lignite markets—indexes of physical volumes shipped to markets, 1957 and 1959–1963, by geographic division, State of destination, and consumer use—Continued

Geographic division, State of destination, and consumer use	1957 (thousand tons)	Index 1957 = 100 (except where noted)				
		1959	1960	1961	1962	1963
South Atlantic—Continued						
Georgia and Florida	3,015	125.2	159.0	162.5	172.4	213.5
Electric utilities	2,108	138.2	184.1	193.8	207.8	266.4
Coke and gas plants	----------	(1)	----------	----------	----------	----------
Retail dealers	530	61.3	74.5	59.4	63.4	56.4
All others	377	140.6	137.1	132.1	127.9	138.2
East South Central	43,283	89.9	96.0	94.2	86.5	109.6
Electric utilities	23,572	103.7	112.6	115.0	122.4	137.6
Coke and gas plants	10,380	77.7	80.8	69.8	70.3	73.6
Retail dealers	2,494	76.3	78.5	74.7	72.6	80.2
All others	6,837	65.8	68.3	66.6	69.3	78.1
Kentucky	11,167	101.2	100.9	101.5	106.3	138.4
Electric utilities	6,758	109.9	107.6	108.1	117.8	154.4
Coke and gas plants	1,683	86.7	87.6	91.0	83.8	111.5
Retail dealers	834	84.4	83.8	99.6	77.2	95.3
All others	1,892	90.6	96.3	88.3	98.4	123.9
Tennessee	15,104	91.0	97.9	90.0	93.5	99.0
Electric utilities	9,876	109.1	119.2	107.2	112.8	119.4
Coke and gas plants	258	72.5	73.6	89.9	96.5	84.5
Retail dealers	1,206	77.2	81.0	69.4	71.6	72.1
All others	3,764	49.1	49.0	51.4	49.5	55.0
Alabama and Mississippi	17,012	81.5	91.9	93.1	98.3	100.0
Electric utilities	6,938	89.9	107.9	133.0	140.7	147.1
Coke and gas plants	8,439	76.1	79.7	64.9	66.8	65.7
Retail dealers	454	59.3	62.3	43.0	66.5	73.8
All others	1,181	79.6	85.0	80.0	85.8	78.6
West South Central: Arkansas, Louisiana, Oklahoma, and Texas	1,868	74.3	59.6	42.9	44.9	42.9
Electric utilities	65	.0	.0	.0	.0	26.2
Coke and gas plants	1,050	79.2	67.3	49.0	61.5	58.7
Retail dealers	161	36.0	44.1	28.0	28.6	23.0
All others	592	84.0	56.8	41.0	24.8	22.3
Mountain	8,779	83.7	97.2	101.7	101.4	123.3
Electric utilities	1,437	161.9	193.5	237.1	263.6	405.8
Coke and gas plants	3,772	60.9	80.9	76.5	60.9	65.3
Retail dealers	1,350	85.5	86.4	82.7	88.4	83.1
All others	2,220	70.6	69.3	68.6	73.0	63.2
Colorado	3,264	85.2	88.4	99.3	102.3	115.0
Electric utilities	687	139.2	177.1	205.1	227.4	264.3
Coke and gas plants	1,324	62.2	64.6	75.4	70.4	85.6
Retail dealers	326	94.8	81.3	85.9	100.0	87.7
All others	927	74.8	59.3	59.9	56.1	55.7
Utah	3,748	66.9	90.1	81.3	64.5	62.3
Electric utilities	367	120.2	137.6	150.4	124.0	118.8
Coke and gas plants	2,448	60.2	89.7	77.1	55.8	54.4
Retail dealers	334	72.2	76.9	75.1	81.7	73.1
All others	599	58.8	70.1	59.3	54.1	53.9
Montana and Idaho	923	102.0	103.1	113.2	120.0	115.5
Electric utilities [4]	1	100.0	105.6	149.2	164.8	160.3
Retail dealers	593	85.5	87.5	80.6	80.9	80.8
All others	329	77.5	74.2	91.2	101.2	91.2
Wyoming	607	147.3	165.7	218.8	236.9	325.7
Electric utilities	340	211.5	245.6	336.2	326.8	520.3
Retail dealers	61	96.7	96.7	91.8	98.4	86.9
All others	206	56.3	54.4	62.6	129.6	75.2
New Mexico	92	122.8	185.9	150.0	116.3	1,230.4
Electric utilities	37	73.0	78.4	89.2	81.1	2,932.4
Retail dealers	12	216.7	358.3	291.7	250.0	183.3
All others	43	139.5	230.2	162.8	109.3	58.1
Arizona and Nevada	145	75.2	98.6	91.7	336.6	387.6
Electric utilities [5]	5	1.5	1.5	.9	100.0	131.0
Retail dealers	24	50.0	100.0	70.8	100.0	158.3
All others	116	79.3	98.3	97.4	111.2	73.3
Pacific	3,142	76.2	72.3	100.6	76.1	80.1
Electric utilities	4	.0	.0	.0	.0	.0
Coke and gas plants	1,708	86.4	75.3	124.2	80.9	96.8
Retail dealers	377	97.3	95.0	106.9	77.7	72.4
All others	1,053	52.3	59.5	60.6	68.0	56.2
Washington and Oregon	1,324	67.7	72.0	74.9	72.8	62.5
Electric utilities	3	.0	.0	.0	.0	.0
Retail dealers	367	98.6	95.6	108.2	78.2	73.3
All others	954	56.1	63.1	62.4	71.0	58.6
California	1,818	82.3	72.5	119.4	78.4	93.0
Electric utilities	1	.0	.0	.0	.0	.0

See footnotes at end of table.

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TABLE 69.—The changing levels of bituminous coal and lignite markets—indexes of physical volumes shipped to markets, 1957 and 1959–1963, by geographic division, State of destination, and consumer use—Continued

Geographic division, State of destination, and consumer use	1957 (thousand tons)	Index 1957 = 100 (except where noted)				
		1959	1960	1961	1962	1963
Pacific—Continued						
California—Continued						
Coke and gas plants	1,708	86.4	75.3	124.2	80.9	96.8
Retail dealers	10	50.0	70.0	60.0	60.0	40.0
All others	99	16.2	25.3	43.4	39.4	33.3
Alaska	829	82.6	86.9	85.6	107.7	103.1
Electric utilities	470	94.5	87.7	43.8	61.5	71.5
Retail dealers	49	138.8	134.7	134.7	155.1	108.2
All others	310	55.8	78.1	141.3	170.3	150.3
Canada [6]	17,878	69.3	63.8	62.5	60.7	76.8
Electric utilities	567	35.3	30.7	21.5	206.2	437.9
Coke and gas plants	4,602	111.1	102.5	114.2	109.6	122.8
Retail dealers	857	102.3	81.3	75.5	74.6	94.6
All others	7,183	58.5	55.5	53.4	55.7	57.0
Canadian Great Lakes Commercial docks (consumer use not available)	2,785	57.9	61.6	43.6	26.1	21.3
Canadian railroad companies	1,884	20.0	6.7	5.0	6.5	4.9
Mexico [7]	(1)	(1)	100.0	96.5	93.0	84.2
All others [7]	(1)	(1)	100.0	96.5	93.0	84.2
Destinations not revealable [8]			100.0	83.2	80.1	97.8
Electric utilities [8]			100.0	74.6	42.1	34.2
Coke and gas plants [8]			100.0	141.2	172.7	161.0
Retail dealers [8]			100.0	69.7	32.3	32.3
All others [8]			100.0	43.9	53.2	133.2
Destinations not available						
Great Lakes vessel fuel [9]	1,859	83.1	76.3	58.3	63.6	58.6
Tidewater bunker fuel [9]	41	41.5	9.8	7.3	29.3	43.9
Railroad fuel, United States companies [10]	7,697	32.6	27.6	23.2	22.4	18.9

[1] Not available.
[2] District 15 shipments to Illinois included with Iowa.
[3] District 9 shipments via river and ex-river to Ohio electric utilities included with Indiana.
[4] For electric utilities in Montana and Idaho the annual base period is 1959=100. The 1959 tonnage shipped to electric utilities was 179,000 tons.
[5] For electric utilities in Arizona and Nevada the annual base period is 1962=100. The 1962 annual tonnage shipped to electric utilities was 335,000 tons.
[6] Includes shipments to Canadian Great Lakes commercial docks and Canadian railroad companies.
[7] Since tonnages for Mexico were first published in 1960, yearly indexes are based on 1960=100. In thousands of tons, 1960 tons were total 57, all others 57.
[8] Since "Destinations not revealable" were first published during 1960, the calendar year indexes are based on 1960=100. In thousands of tons these figures are as follows: Calendar year 1960 total not revealable 1,380, electric utilities 497, coke and gas plants 374, retail dealers 99, all others 410.
[9] Included in summary at beginning of table in all others.
[10] Included in summary at beginning of table in railroad fuel.

RELATIVE RATE OF GROWTH OF MINERAL FUELS AND WATERPOWER

Information on the trends in consumption of the various energy fuels and waterpower is presented in the Review of Mineral-Fuel Industries, 1962 Minerals Yearbook, volume 2.

STOCKS

The figures on stocks are based on complete coverage for all categories except "Other manufacturing and mining industries" and "Retail dealer stocks." Stocks for these two categories are based on samples, and the statistical procedure followed is that for calculating total consumption.

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TABLE 70.—Stocks of bituminous coal and lignite in the hands of commercial consumers and in retail dealers' yards in the United States

Date	Total stocks (net tons)	Days' supply at current rate of consumption on date of stocktaking						
			Manufacturing and mining industries					
		Electric power utilities	Oven coke plants	Steel and rolling mills	Cement mills	Other manufacturing and mining industries	Retail dealers	Total
1962								
Jan. 31	66,940,000	79	41	18	56	38	3	53
Feb. 28	64,523,000	79	38	19	57	37	3	52
Mar. 31	63,222,000	81	39	22	48	41	3	55
Apr. 30	64,185,000	92	40	24	45	46	5	62
May 31	66,402,000	92	47	30	43	50	15	69
June 30	69,327,000	94	58	30	44	52	18	73
July 31	66,098,000	91	51	31	45	63	16	73
Aug. 31	68,489,000	90	49	29	45	59	11	71
Sept. 30	70,241,000	99	47	26	47	57	8	72
Oct. 31	72,818,000	100	49	23	50	50	6	71
Nov. 30	73,578,000	95	49	21	48	48	6	67
Dec. 31	69,691,000	83	45	18	47	44	4	59
1963								
Jan. 31	63,804,000	71	38	15	49	39	3	50
Feb. 28	59,473,000	66	36	15	45	36	2	46
Mar. 31	56,959,000	72	31	17	40	38	4	51
Apr. 30	59,764,000	81	30	21	38	44	9	57
May 31	64,551,000	89	33	22	38	47	13	63
June 30	67,638,000	87	36	27	40	52	20	65
July 31	63,318,000	81	31	28	43	54	18	62
Aug. 31	67,002,000	82	36	32	43	55	14	64
Sept. 30	69,388,000	89	37	28	45	53	11	66
Oct. 31	72,708,000	91	39	29	50	48	12	67
Nov. 30	73,383,000	88	40	23	48	46	10	64
Dec. 31	70,083,000	74	39	17	47	40	5	54

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PRICES

TABLE 71.—Average value per ton, f.o.b. mines, of bituminous coal and lignite produced in the United States, by States

	1962				1963			
	Underground	Strip	Auger	Total	Underground	Strip	Auger	Total
Alabama	$7.95	$5.40	$6.49	$7.39	$7.89	$5.67	$7.74	$7.38
Alaska	6.30	7.51		7.35		6.93		6.93
Arkansas	7.41	6.89		7.07	7.17	6.64		6.82
Colorado	6.37	3.65		5.92	6.66	3.50		5.93
Georgia	3.53			3.53	3.63			3.63
Illinois	3.81	3.90		3.86	3.77	3.83		3.80
Indiana	4.14	3.70		3.82	4.07	3.67		3.78
Iowa	4.27	3.44		3.56	4.22	3.39		3.50
Kansas	4.64	4.64		4.64	4.54	4.54		4.54
Kentucky	4.33	3.27	3.06	3.91	4.27	3.14	2.99	3.82
Maryland	4.58	3.32		3.86	4.10	3.51		3.73
Missouri	5.20	4.14		4.16	5.41	4.15	3.15	4.16
Montana:								
Bituminous	6.97	5.25		6.90	7.64	5.25		7.51
Lignite	4.81	1.91		1.99	4.64	1.90		1.95
Total Montana	6.76	1.94		2.98	7.36	1.94		2.82
New Mexico	5.21	2.86		3.83	6.02	2.29		2.89
North Dakota (lignite)	4.70	2.24		2.24	4.60	2.19		2.19
Ohio	4.34	3.51	3.18	3.72	4.28	3.49	3.20	3.70
Oklahoma	12.59	5.60		6.66	11.77	5.28		5.63
Pennsylvania	5.84	3.66	3.13	5.07	5.62	3.58	3.57	4.90
South Dakota (lignite)		4.30		4.30		3.74		3.74
Tennessee	3.78	3.41	3.39	3.63	3.81	3.60	3.35	3.71
Utah	5.40			5.40	5.22			5.22
Virginia	4.08	2.94	3.50	3.99	4.12	2.85	2.89	3.96
Washington	6.94	6.40		6.94	7.28	6.62		7.26
West Virginia	4.99	3.61	3.56	4.88	4.90	3.57	3.50	4.79
Wyoming	6.12	2.90		3.20	6.17	3.06		3.18
Total	4.91	3.64	3.33	4.48	4.82	3.57	3.25	4.39

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TABLE 72.—Production and average value per ton, f.o.b. mines, of bituminous coal and lignite sold in open market and not sold in open market, 1963, by States

State	Production					Average value per ton, f.o.b. mines		
	Sold in open market		Not sold in open market		Total (net tons)	Sold in open market	Not sold in open market	Total
	Net tons	Percentage of total	Net tons	Percentage of total				
Alabama	5,164,734	41.8	7,194,228	58.2	12,358,962	$6.57	$7.97	$7.38
Alaska	853,398	100.0			853,398	6.93		6.93
Arkansas	220,650	100.0			220,650	6.82		6.82
Colorado	2,935,875	79.6	754,637	20.4	3,690,512	4.99	9.60	5.93
Georgia	4,550	100.0			4,550	3.63		3.63
Illinois	51,736,316	100.0			51,736,316	3.80		3.80
Indiana	15,094,707	99.9	4,972	.1	15,099,679	3.78	4.10	3.78
Iowa	1,212,989	100.0			1,212,989	3.50		3.50
Kansas	1,168,679	100.0			1,168,679	4.54		4.54
Kentucky	71,204,007	92.1	6,146,444	7.9	77,350,451	3.63	6.04	3.82
Maryland	1,161,968	100.0			1,161,968	3.73		3.73
Missouri	3,174,502	100.0			3,174,502	4.16		4.16
Montana:								
Butiminous	53,466	100.0			53,466	7.51		7.51
Lignite	289,532	100.0			289,532	1.95		1.95
Total Montana	342,998	100.0			342,998	2.82		2.82
New Mexico	1,658,647	85.3	286,203	14.7	1,944,850	2.36	6.00	2.89
North Dakota (lignite)	2,398,988	100.0			2,398,988	2.19		2.19
Ohio	32,061,911	87.1	4,727,919	12.9	36,789,830	3.75	3.33	3.70
Oklahoma	965,530	95.8	42,126	4.2	1,007,656	5.30	13.00	5.63
Pennsylvania	48,068,607	67.3	23,412,346	32.7	71,500,953	4.17	6.39	4.90
South Dakota (lignite)	16,561	100.0			16,561	3.74		3.74
Tennessee	6,051,673	98.9	69,391	1.1	6,121,064	3.71	3.50	3.71
Utah	2,198,922	50.4	2,160,609	49.6	4,359,531	4.75	5.69	5.22
Virginia	30,509,716	99.9	21,279	.1	30,530,995	3.96	5.26	3.96
Washington	185,640	97.6	4,585	2.4	190,225	7.21	9.30	7.26
West Virginia	115,879,229	87.4	16,688,534	12.6	132,567,763	4.64	5.81	4.79
Wyoming	1,559,635	49.9	1,564,470	50.1	3,124,105	3.70	2.65	3.18
Total	395,850,432	86.3	63,077,743	13.7	458,928,175	4.12	6.08	4.39

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LIGNITE

TABLE 73.—Summary of operations at lignite mines in the United States, 1963, by States [1]

Item	Montana	North Dakota	South Dakota	Total
UNDERGROUND MINES				
Number of mines	3	1		4
Shot from solid net tons	3,846	1,880		5,726
Cut by machines do	1,322			1,322
Total production do	5,168	1,880		7,048
Number of cutting machines	2			2
Average output per machine net tons	653			653
Underground production cut by machine percent	25.6			25.6
Average value per ton	$4.64	$4.60		$4.63
Average number of men working daily	9	3		12
Average number of days worked	128	70		113
Number of man-days worked	1,151	209		1,360
Average tons per man per day	4.49	9.00		5.18
STRIP MINES				
Number of strip mines	1	29	1	31
Production net tons	284,364	2,397,108	16,561	2,698,033
Average value per ton	$1.90	$2.19	$3.74	$2.17
Number of shovels and draglines	2	50	2	54
Average number of men working daily	15	309	8	332
Average number of days worked	251	208	183	209
Number of man-days worked	3,766	64,124	1,460	69,350
Average tons per man per day	75.51	37.38	11.34	38.90
TOTAL, ALL LIGNITE MINES				
Number of mines	4	30	1	35
Production (net tons):				
Shipped by rail [2]	284,364	1,807,955		2,092,319
Shipped by truck	5,163	324,462	16,286	345,911
Used at mines [3]	5	266,571	275	266,851
Total	289,532	2,398,988	16,561	2,705,081
Average value per ton	$1.95	$2.19	$3.74	$2.17
Average number of men working daily	24	312	8	344
Average number of days worked	205	206	183	206
Number of man-days worked	4,917	64,333	1,460	70,710
Average tons per man per day	58.88	37.29	11.34	38.26

[1] Exclusive of Texas (lignite).
[2] Includes coal loaded at mines directly into railroad cars and hauled by trucks to railroad sidings.
[3] Includes coal used at mine for power and heat, made into beehive coke at mine, used by mine employees, used for all other purposes at mine, and transported from mine to point of use by conveyor or tram.

FOREIGN TRADE

Imports of bituminous coal and lignite are very small. Exports have been an important item of foreign trade for many years, particularly since the close of World War II. See figure 16.

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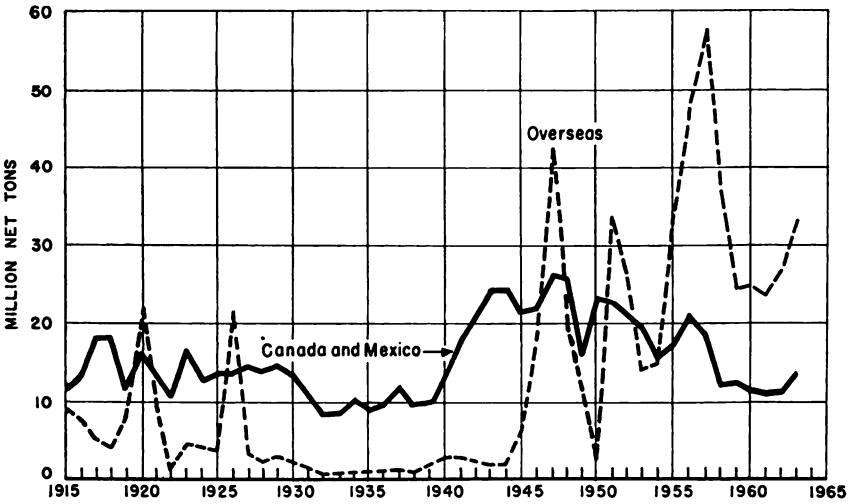

FIGURE 16.—Exports of bituminous coal and lignite from the United States to Canada and Mexico and overseas, 1915–63.

TABLE 74.—Bituminous coal [1] imported for consumption in the United States, by countries and customs districts

(Net tons)

Country and customs district	1961	1962	1963
Country:			
North America: Canada	164,125	232,417	172,221
Europe:			
Germany, West			(2)
United Kingdom			3
Asia: Japan	134	7	
Total	164,259	232,424	172,224
Customs district:			
Alaska	10	20	10
Buffalo		783	(2)
Colorado	80		
Duluth and Superior		2,214	
Los Angeles	134		3
Maine and New Hampshire	136,732	224,199	171,002
Massachusetts		7	
Montana and Idaho	27,008	5,196	1,209
New York	295		
St. Lawrence		5	
Total	164,259	232,424	172,224

[1] Includes slack, culm, and lignite.
[2] Less than 1,000 tons.

Source: Bureau of Census.

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TABLE 75.—Exports of bituminous coal, by country groups

(Thousand net tons)

Year	Canada (including Newfoundland) and Mexico	Overseas (all other countries)								Grand total
		West Indies and Central America [1]	Miquelon, Bermuda, and Greenland	South America	Europe	Asia	Africa	Oceania	Total overseas	
1954–58 (average)	16,933	44	3	1,876	32,579	3,901	186	----------	38,589	55,522
1959	12,459	17	(2)	1,499	19,128	4,077	73	----------	24,794	37,253
1960	11,696	18	2	2,178	16,936	5,654	57	----------	24,845	36,541
1961	11,223	3	3	1,786	15,275	6,617	63	(2)	23,747	34,970
1962	11,461	10	5	2,159	18,284	6,467	27	----------	26,952	38,413
1963	13,809	6	5	1,933	25,218	6,064	43	----------	33,269	47,078

[1] Includes Panama.
[2] Less than 1,000 tons.

Source: Bureau of the Census.

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TABLE 76.—Bituminous coal exported from the United States, by countries [1]

(Net tons)

Country	1960	1961	1962	1963
North America:				
Canada	11,638,739	11,169,056	11,409,746	[2] 13,762,062
Central America:				
Costa Rica	20	147	50	665
El Salvador	45	101	144	
Guatemala	136	229	3,208	406
Honduras	135	450	439	255
Panama	20	72	123	2,938
Other	32	15	39	
Greenland			506	
Mexico	57,332	53,992	[3] 51,056	47,036
Miquelon	2,328	2,813	4,759	5,004
West Indies:				
British:				
Bahamas			3,042	
Bermuda				404
Jamaica		25	68	
Trinidad and Tobago	2,129	466	1,795	444
Cuba	14,482			
Dominican Republic	59	355		
French	588	906	623	985
Netherlands Antilles			15	28
Total	11,716,045	11,228,627	[3] 11,475,613	13,820,227
South America:				
Argentina	680,546	576,990	670,727	531,390
Brazil	1,048,716	978,700	1,316,150	1,155,806
Chile	368,545	177,999	114,126	180,193
Uruguay	79,919	33,972	57,779	47,684
Venezuela		16,970		18,151
Other	34	1,337	438	
Total	2,177,760	1,785,968	2,159,220	1,933,224
Europe:				
Austria	587,626	322,707	251,949	44,790
Belgium-Luxembourg	1,106,037	904,907	1,083,949	2,107,443
Czechoslovakia		39,617	13,761	76,718
Denmark	130,157	80,022	37,570	43,785
Finland			568	6,726
France	732,319	643,729	710,080	2,002,294
Germany, West	4,565,556	4,203,520	4,812,249	5,508,144
Greece			57,554	70,563
Ireland	207,787	195,255	241,011	464,269
Italy	4,845,814	4,728,556	5,837,218	7,611,833
Netherlands	2,785,484	2,447,480	3,186,593	4,170,478
Norway	76,932	50,918	17,453	13,386
Portugal	52,453	67,046	125,398	229,095
Spain	331,439	227,574	766,095	1,405,748
Sweden	645,193	820,136	725,715	874,763
Switzerland	322,815	70,494		86,995
Trieste	38,392	51,970		
United Kingdom			1,933	50
Yugoslavia	508,427	420,444	414,514	404,220
Other				96,471
Total	16,936,431	15,274,375	18,283,610	25,217,771
Asia:				
Indonesia	23,308	1,079		11,107
Japan	5,617,191	6,610,166	6,465,395	6,052,859
Turkey	11,814		63	
Viet-Nam		6,121		
Other	1,428	79	1,700	336
Total	5,653,741	6,617,445	6,467,158	6,064,302
Africa:				
Angola	5,596	55		
Ethiopia				10,641
Libya	44,832	45,432	16,408	10,405
United Arab Republic (Egypt)	5,731	17,815	11,362	11,233
Other	939			10,632
Total	57,098	63,302	27,770	42,911
Oceania: Australia		108		
Grand total	36,541,075	34,969,825	[3] 38,413,371	47,078,435

[1] Amounts stated do not include fuel or bunker coal loaded on vessels engaged in foreign trade, which aggregated 307,812 tons in 1960, 275,017 tons in 1961, 213,161 tons in 1962, and 223,142 tons in 1963.
[2] Adjusted by Bureau of Mines to include 6,995 tons reported by the Census as Aden.
[3] Revised figure.

Source: Bureau of Census.

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TABLE 77.—Bituminous coal exported from the United States, by customs districts

(Net tons)

Customs district	1960	1961	1962	1963
North Atlantic:				
Maine and New Hampshire	2,120	2,459	3,224	1,934
Massachusetts	54		187	
New York	12,255	5,448	23,300	2,645
Philadelphia	39,092	14,900	41,048	215,845
South Atlantic:				
Maryland	1,471,576	1,160,824	2,119,628	3,477,457
Virginia	23,231,067	22,644,561	24,883,469	29,675,818
Gulf Coast:				
Galveston	45	1,092	316	1,455
Mobile	110,031	30,086		127
New Orleans	388	1,277	1,151	12,304
Sabine	2,440			
Mexican border:				
Arizona	199		61	56
El Paso	56,802	55,353	[1] 49,022	36,303
Laredo	239	417	1,841	3,215
Pacific Coast:				
Los Angeles	60			
San Diego	92			
San Francisco		81	30	236
Washington	8,254	820	1,186	
Northern border:				
Buffalo	232,078	148,542	150,701	160,215
Chicago	40,412	33,079	10,821	41,056
Dakota	15,294	9,544	7,721	7,101
Duluth and Superior	12,139	6,516	22,482	2,510
Indiana	939	4,822	4,777	
Michigan	349,790	271,739	259,223	184,224
Minnesota				212
Montana and Idaho	289	1,921	2,282	2,095
Ohio	9,312,614	9,061,261	9,096,160	10,338,842
Rochester	1,265,978	1,207,334	1,493,491	2,758,490
St. Lawrence	375,447	298,277	240,901	148,613
Vermont	55	141	235	7,462
Wisconsin		42		
Miscellaneous:				
Alaska			84	
Kentucky	1,326		30	
Connecticut				220
St. Louis		9,289		
Total	36,541,075	34,969,825	[1] 38,413,371	47,078,435

[1] Revised.

Source: Bureau of Census.

TABLE 78.—Shipments of bituminous coal to possessions and other areas administered by the United States

(Net tons)

Territory	1961	1962	1963
Guam	4	3	12
Puerto Rico	1,659	2,264	1,979
Virgin Islands	8	11	18

Source: Bureau of Census.

WORLD PRODUCTION

The United States supplied 477 million tons of bituminous coal, anthracite, and lignite, or 16 percent of the world output, in 1963.

World coal output increased 2 percent, principally in the United States and Europe.

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TABLE 79.—World production of bituminous coal, anthracite, and lignite by countries [1]

(Thousand short tons)

Country	1959	1960	1961	1962	1963 [2]
North America:					
Canada:					
Bituminous	8,679	8,840	8,189	8,028	8,702
Lignite	1,947	2,171	2,209	2,256	1,874
Greenland: Bituminous	29	31	35	29	44
Mexico: Bituminous	1,769	1,958	2,004	2,087	2,283
United States:					
Anthracite (Pennsylvania)	20,649	18,817	17,446	16,894	18,267
Bituminous	409,248	412,766	399,959	419,094	456,223
Lignite	2,780	2,746	3,018	3,055	2,705
Total	445,101	447,329	432,860	451,443	490,098
South America:					
Argentina: Bituminous	348	309	379	315	276
Brazil: Bituminous (including lignite)	2,568	2,568	2,635	2,765	2,927
Chile: Bituminous (mined)	2,083	1,570	1,944	2,045	1,919
Colombia: Bituminous	2,756	2,866	3,068	3,307	3,527
Peru: Bituminous and anthracite	191	179	184	180	144
Venezuela: Bituminous	37	39	34	30	46
Total	7,983	7,531	8,244	8,642	8,839
Europe:					
Albania: Lignite	317	320	319	331	[3] 331
Austria:					
Bituminous	148	146	117	109	115
Lignite	6,857	6,584	6,240	6,296	6,672
Belgium: Bituminous and anthracite	25,085	24,763	23,739	23,398	23,609
Bulgaria:					
Bituminous and anthracite	554	628	651	701	809
Lignite	16,377	18,273	19,890	22,669	23,343
Czechoslovakia:					
Bituminous	27,694	28,896	28,917	29,927	31,191
Lignite	59,198	64,378	71,984	76,594	80,803
Denmark: Lignite	2,540	2,545	2,384	2,232	[3] 1,653
France:					
Bituminous and anthracite	63,501	61,692	57,715	57,728	52,640
Lignite	2,398	2,512	3,203	3,177	2,728
Germany:					
Bituminous and anthracite:					
East	3,132	2,999	2,944	2,844	[3] 2,789
West (including Saar)	157,237	157,911	158,309	156,417	156,656
Lignite:					
East	236,776	248,532	261,166	272,262	280,428
West	102,991	105,974	107,140	111,610	117,569
Pech coal: West	2,022	2,021	1,943	1,942	2,029
Greece: Lignite	1,676	2,747	2,760	2,971	3,836
Hungary:					
Bituminous	3,014	3,138	3,385	3,685	4,091
Lignite	24,934	26,098	27,672	27,901	29,504
Ireland: Bituminous and anthracite	258	229	224	225	230
Italy:					
Bituminous and anthracite	815	812	817	763	645
Lignite	1,347	875	1,661	1,958	1,506
Netherlands:					
Bituminous and anthracite	13,203	13,777	13,912	12,757	12,686
Lignite	219	4	----------	----------	----------
Poland:					
Bituminous	109,246	115,123	117,513	120,818	124,726
Lignite	10,205	10,281	11,396	12,226	16,914
Portugal:					
Anthracite	581	480	518	446	459
Lignite	175	172	174	169	157
Rumania:					
Bituminous and anthracite	331	331	331	419	[3] 441
Lignite	8,462	8,667	9,264	10,151	10,876
Spain:					
Bituminous and anthracite	14,926	15,193	15,207	13,994	14,305
Lignite	2,317	1,942	2,303	2,743	2,831
Svalbard (Spitzbergen): Bituminous:					
Controlled by Norway	278	445	407	489	433
Controlled by U.S.S.R.	505	529	439	405	[3] 441
Sweden: Bituminous	300	277	220	153	99
Switzerland: Bituminous and anthracite (including lignite) [3]	11	11	11	11	11

See footnotes at end of table.

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TABLE 79.—World production of bituminous coal, anthracite, and lignite by countries [1]—Continued

(Thousand short tons)

Country	1959	1960	1961	1962	1963 [2]
Europe—Continued					
U.S.S.R.:[4]					
Bituminous and anthracite	402,586	413,284	415,592	425,933	429,901
Lignite	155,851	152,406	147,176	144,403	154,323
United Kingdom: Bituminous and anthracite	230,839	216,838	213,320	221,129	219,291
Yugoslavia:					
Bituminous	1,431	1,414	1,447	1,310	1,418
Lignite	21,836	23,623	25,089	25,910	28,810
Total [4]	1,712,173	1,736,870	1,757,499	1,799,206	1,841,299
Asia:					
Afghanistan: Bituminous	40	51	75	[3] 74	108
Burma: Bituminous	1	(5)	2	2	[3] 2
China: Bituminous, anthracite, and lignite	383,383	460,000	275,000	275,000	300,000
India:					
Bituminous	52,690	57,974	61,801	67,649	72,672
Lignite	36	52	71	233	1,093
Indonesia: Bituminous	703	725	606	519	635
Iran: Bituminous [6]	261	254	220	220	[3] 220
Japan:					
Bituminous and anthracite	52,093	56,292	60,058	59,965	57,377
Lignite	1,619	1,552	1,443	1,225	1,008
Korea:					
North: Anthracite, bituminous and lignite	9,765	11,707	12,996	14,550	15,476
Republic of: Anthracite	4,559	5,897	6,486	8,206	9,765
Malaya: Bituminous	85	8			
Mongolia, Outer: Lignite and bituminous	665	682	826	[3] 770	[3] 880
Pakistan: Bituminous and lignite	810	916	1,015	1,097	[3] 1,215
Philippines: Bituminous	154	163	168	180	173
Taiwan: Bituminous	3,928	4,367	4,670	5,020	5,302
Thailand: Lignite	155	164	119	149	151
Turkey (mined):					
Bituminous	7,191	6,952	7,035	7,156	[3] 7,220
Lignite	4,038	3,760	4,159	4,668	[3] 4,870
Viet-Nam:					
North: Anthracite	2,427	2,860	3,118	3,823	[3] 4,400
South: Anthracite	22	30	63	78	115
Total [4]	524,625	614,406	439,931	450,584	482,682
Africa:					
Algeria: Bituminous and anthracite	134	131	86	58	44
Congo, Republic of the (formerly Belgian): Bituminous	294	180	80	84	101
Malagasy, Republic of: Bituminous			2		
Morocco: Anthracite	513	454	452	408	445
Mozambique: Bituminous	283	298	354	328	312
Nigeria: Bituminous	831	629	669	699	657
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia: Bituminous	4,144	3,923	3,387	3,115	3,020
South Africa, Republic of: Bituminous and anthracite (marketable)	40,182	42,079	43,613	45,498	46,798
Swaziland: Anthracite and bituminous	1	13	1		
Tanganyika: Bituminous	2	2	2	3	2
Total	46,384	47,709	48,646	50,193	51,379
Oceania:					
Australia:					
Bituminous	22,734	25,277	26,886	27,398	27,664
Lignite	14,599	16,763	18,232	19,193	21,000
New Zealand:					
Bituminous and anthracite	2,956	3,194	3,101	2,690	2,890
Lignite	191	180	175	166	181
Total	40,480	45,414	48,394	49,447	51,735
Lignite (total of items shown above) (estimate)	680,506	704,003	730,073	755,318	796,046
Bituminous and anthracite (by subtraction)	2,096,240	2,195,256	2,005,501	2,054,197	2,129,986
World total, all grades (estimate)	2,776,746	2,899,259	2,735,574	2,809,515	2,926,032

[1] This table incorporates some revisions.
[2] Preliminary.
[3] Estimate.
[4] Output from U.S.S.R. in Asia (including Sakhalin) included with U.S.S.R. in Europe.
[5] Less than 500 tons.
[6] Year ended March 20 of year following that stated.

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COAL TECHNOLOGY

Significant accomplishments were made in the technology of mining, preparation, and transportation of coal that enabled the coal industry to furnish quality coal at lower cost. In addition, aggressive attention to research on coal utilization was shown by both Government and industry in efforts to improve coal's position in the energy market. Supplementing the work of the Bureau of Mines, the Office of Coal Research of the U.S. Department of the Interior awarded three additional contracts during 1963 for studies aimed at increasing the consumption of coal.

During the year, the deepest bituminous coal mine shaft in North America, approximately 1,480 feet, was completed and mining facilities were under construction. Ultimately, the mine will produce 1.5 million tons of metallurgical coal annually. In another underground mining development, the Bureau of Mines completed the evaluation of longwall mining in a West Virginia coalbed. The use of self-advancing hydraulic roof support units makes the longwall technique more competitive with conventional room-and-pillar methods. Overall recovery with the coal planer in the Bureau tests was 85 to 95 percent and output per man-shift was increased about 38 percent over conventional mining. By the end of 1963 there were at least six longwall operations in use in the United States. Overseas, mechanized coal production in European Coal and Steel Community (ECSC) countries, reportedly doubled in the 5 years preceding 1963 with the increased use of modern cutter-loaders and self-advancing roof supports.

In surface mining, as in the past several years, the emphasis was on larger earth-moving equipment. One company ordered a 200-cubic-yard shovel. The mammoth shovel, as high as a 21-story building, will be capable of depositing overburden 150 yards from the excavation. Fabrication and erection at the mining site is expected to take 2½ years. At another mine, a walking dragline using an 85-cubic-yard bucket on a 275-foot boom was used to speed up removal of overburden. A push-button miner was successfully operated to recover additional coal from the highwall. The machine is capable of boring some 800 feet into the highwall with the coal being removed by remote control operation.

Experiments continued on degasification techniques to eliminate troublesome build-up in methane concentration at the working face. Tests conducted by the Bureau of Mines at a cooperating mine in southern West Virginia showed that infusion of water into holes drilled into the coalbed ahead of the mining area increased the emission of methane from the coal face. The methane content in the main return air after infusion was reduced by more than 86 percent of the amount recorded before the tests were made. Methane concentrations were recorded on a device that continuously analyzes and which was designed and built by the Bureau.

In the field of coal preparation, several additional companies installed or planned installation of new coal preparation plants to replace outmoded facilities or new coal cleaning equipment to supplement existing plants. A survey of sales of new equipment, in terms of capacity, showed that dense medium ranked first, followed by jigs,

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pneumatic wet tables, and flotation. In experimental work conducted by the Bureau of Mines, a tenfold increase in dewatering capacity of the vibrating screen and a threefold increase in recovery of fine coal were achieved using a conventional sieve bend ahead of a vibrating screen or attached to the vibrator as a scalping deck. These results were achieved with no sacrifice in the moisture content of the oversize product.

The competitive threat from pipelines for transporting coal continued to provide the stimulus for the adoption by the railroad industry of more efficient methods and equipment for delivering coal. One such device that makes rail transport of coal more efficient is the 100-ton coal car specially designed for integral train service. One model of this car is designed to use rotary dump installations to their maximum capabilities; another is a bottom-unloading rapid-dump car, designed to unload in less than 20 seconds. The use of "unit trains" increased throughout the industry, and several major railroads were able to reduce freight rates significantly by use of this single trainload concept. The only operating coal pipeline was closed down during the year, probably as a direct result of the decrease in freight rates.

During the year, a major coal handling railroad opened a new multi-million dollar port facility designed especially to load the new supercolliers used in the international coal trade. The 1600-foot pier has a dumping rate of 20,000 tons of coal per hour, with two giant traveling cranes that can service two ships simultaneously. Supporting facilities include new trackage that bring the total car capacity to more than 21,000 units. One supercollier bound for Japan loaded 54,323 net tons of metallurgical coal at Hampton Roads, Va., to set a new record for coal tonnage.

Additional construction of mine-mouth electric generating facilities was announced, with the largest one to be located in Western Pennsylvania. The 1.8 million kilowatt plant is expected to burn 6 million tons of coal per year. Mine-mouth facilities have become technologically feasible as a result of the development of techniques for transmitting electricity at extra-high voltages. Several additional private companies began planning or construction of extra-high voltage networks. Meanwhile, rate reductions were put into effect by many of the electric utilities as a result of savings in coal shipping costs through the use of unitized trains and through more efficient operation.

Magnetohydrodynamics and its application to generation of electric power was investigated by the Bureau of Mines and others. An industrial research laboratory announced operation of an experimental magnetohydrodynamic (MHD) generator with a power output more than one megawatt. Work was begun under an Office of Coal Research contract on development of a coal-burning, solid electrolyte fuel cell for potential use in central power plants.

Continued interest was shown in the injection of supplementary fuels into blast furnaces as partial replacement for coke, a practice that has been adopted by several commercial firms as a means of increasing production of pig iron. Additional tests were conducted with coal in the Bureau of Mines experimental blast furnace under a cooperative program with industry. A new experimental blast furnace to operate at pressures up to 55 pounds per square inch top

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pressure was being constructed by the Bureau to study such factors as the effect of injecting coal at very high rates and the optimum particle size for the ore and fuel with which the furnace is charged.

Testing of a coal-fired gas turbine locomotive by a major Western railroad continued; by mid-year some 50 tests trips had been completed. The experimental turbine being developed by the Bureau of Mines as a possible new source of electric power was operated in an extended test to determine the extent of erosion of the turbine blades caused by the hot ash particles.

Special chemicals or materials derived from coal continued to receive attention during the year. Bureau of Mines research demonstrated that humic acids with less than 2 percent ash could be obtained from leonardite (a naturally oxidized lignite). The ash-free material was investigated as a base for a soil-conditioner-fertilizer preparation. Operations were started in North Dakota to recover uranium from lignite ash. In this process lignite is burned at the mine and the ash is moved to the refining plant for uranium recovery. The production of light-weight aggregate from fly ash was planned by several large utilities in facilities adjacent to existing power plants. One such plant under construction is designed to convert 1,200 tons per day of fly ash into aggregate for concrete.

Coal technology activities of the Bureau of Mines are reviewed in a separate report published annually.

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Coal—Pennsylvania Anthracite

By J. A. Vaughan [1]

CONTENTS

	Page		Page
General summary	175	Distribution	208
Scope of report	182	Consumption	213
Acknowledgments	183	Stocks	215
Production, mining methods, and equipment	183	Foreign trade	216
Prices and value of sales	201	World production	218
Employment	207	Technology	219

GENERAL SUMMARY

PRODUCTION of Pennsylvania anthracite totaled 18.3 million short, or net, tons in 1963, an increase of 8 percent over that of 1962. Although each source of production, except dredges, contributed to the increase, the gain at deep mines was less than 1 percent, while the output from strip pits and culm banks increased 9 percent and 27 percent, respectively, over that of 1962. As a result, underground output decreased from 40 percent of the total in 1962 to 37 percent in 1963, strip pits increased from 40 to 41 percent, and culm banks increased from 16 to 18 percent. Production of river coal was 4 percent of the total in both years.

The strong demand for Pennsylvania anthracite in overseas markets had a marked effect upon prices and industry revenue. Except for buckwheat No. 3 (barley) and buckwheat No. 5, each size commanded a higher price than in 1962. For example, the average value of the pea and larger group of sizes was $11.65 per net ton, an increase of $0.75, or 7 percent, and the average for the buckwheats was $6.25, a gain of $0.32 per ton, or 5 percent. The average value for all sizes increased to $8.45, $0.47 per ton more than in 1962. Consequently, total value of the 1963 output, f.o.b. preparation plant, rose to $153.5 million, 14 percent more than in 1962. Production of pea and larger sizes increased 7 percent, yet these sizes accounted for only 41 percent of the output (as in 1962) because of a gain of 9 percent in the output of buckwheat No. 1 and smaller sizes. However, the larger sizes continued to supply the major part of the industry revenue because of their higher per-ton prices.

[1] Mineral specialist (coal).

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Apparent consumption of anthracite in the United States was estimated at 14.2 million tons—a loss of less than 1 percent. Although use data are incomplete for anthracite, the slight decline in apparent consumption indicates industrial demand for the smaller sizes increased almost enough to counterbalance the loss of 15 percent in retail-dealer deliveries outside the region. Adding credence to this conclusion is the fact that, although small declines occurred at cement and public utility plants, the iron and steel industry stepped up consumption by 19 percent.

According to the Bureau of the Census, U.S. Department of Commerce, exports of anthracite totaled approximately 3.4 million tons in 1963, an increase of 86 percent. The entire gain, as in 1962, was attributable to trade with Western Europe since minor increases in exports to Asia, Africa, and Oceania were offset by declines in North, South, and Central America. However, a more accurate measurement of the importance of exports to the industry can be obtained by adding the quantity shipped to West Germany for the use of U.S. Armed Forces to exports reported by the Bureau of the Census. Thus approximately 4,162,000 tons were actually exported, 23 percent of the 1963 production—or nearly 1 ton out of every 4 produced.

In 1963, the anthracite industry was able to increase production 8 percent over that of 1962 with a labor force of 13,498 men (4 percent less) by increasing working time and stepping up production from strip pits and culm banks. Anthracite operations were active an average of 216 days, a gain of 12 days over that of 1962; however, this additional working time increased the total man-days worked to 2,912,000, 2 percent more than in 1962. The productivity rate again reached a record high, 6.27 tons per man-day, primarily because of the increased output at strip- and culm-bank operations, where productivity rates are much higher than at deep mines.

Combining fatal and nonfatal injuries, the overall injury rate in the anthracite industry increased to 63.05 per million man-hours, compared with 57.40 per million in 1962. A total of 32 men lost their lives at anthracite operations (26 in 1962) at a frequency rate of 1.52 per million man-hours (1.26 in 1962). Nonfatal injuries totaled 1,295 during the year, compared with 1,161 in 1962; the rate increased from 56.14 per million hours in 1962 to 61.53.

Table 1 includes salient annual statistics for 1959–63; monthly developments in the industry in 1963 are shown in table 2. Table 3 shows selected historical data for 1890–1963.

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TABLE 1.—Salient statistics of the Pennsylvania anthracite industry, 1959–63

	1959	1960	1961	1962	1963
Production:					
Preparation plants ____net tons__	19,804,532	18,003,730	16,655,847	16,015,366	17,415,365
Dredges____do____	716,169	711,713	745,498	726,666	691,370
Used at collieries for power and heat____net tons__	128,585	101,998	45,094	151,614	160,649
Total production____do____	20,649,286	18,817,441	17,446,439	16,893,646	18,267,384
Value of production____	$172,319,913	$147,116,250	$140,337,541	$134,093,874	$153,503,442
Average sales realization per net ton on preparation plant shipments (excludes dredge coal):					
Pea and larger____	$11.04	$10.42	$10.80	$10.90	$11.65
Buckwheat No. 1 and smaller____	$6.60	$6.27	$6.32	$6.14	$6.43
All sizes____	$8.55	$8.01	$8.26	$7.99	$8.64
Percentage of total preparation plant shipments (excludes dredge coal):					
Pea and larger____	43.8	42.0	43.4	43.1	42.4
Buckwheat No. 1 and smaller____	56.2	58.0	56.6	56.9	57.6
Producers' stocks at end of year [1] net tons__	429,020	199,356	232,520	[2]	[2]
Exports [3]____do____	1,787,558	1,440,400	1,435,335	[4] 1,801,724	3,353,192
Imports [3]____do____	2,633	1,476	792	7,583	[5]
Consumption (apparent)____do____	18,800,000	17,600,000	15,900,000	[4] 14,300,000	14,200,000
Average number of days worked____	173	176	196	204	216
Average number of men working daily	23,294	19,051	15,792	14,010	13,498
Output per man per day____net tons__	5.12	5.60	5.63	5.92	6.27
Output per man per year____do____	886	986	1,103	1,208	1,354
Quantity cut by machines____do____	260,502	225,520	236,166	277,537	240,427
Quantity mined by stripping____do____	7,096,343	7,112,288	7,246,646	6,822,207	7,467,842
Quantity loaded by machines underground____net tons__	4,700,542	4,044,392	3,377,778	3,065,364	3,665,962
Distribution:					
Receipts in New England [6]____do____	869,166	697,353	634,435	495,390	422,012
Exports to Canada [3]____do____	1,453,228	1,204,414	965,576	892,488	794,585
Loaded into vessels at Lake Erie [7] net tons__	329,204	244,468	221,435	196,440	191,609
Receipts at Duluth-Superior [8] do____	71,845	65,713	33,474	[4] 26,516	35,121

[1] Anthracite Committee.
[2] This series discontinued.
[3] U.S. Department of Commerce. 1961–63 export data does not include shipments to U.S. military forces. See NOTE, tables 2 and 35.
[4] Revised.
[5] Import data discontinued with August. See table 2.
[6] Commonwealth of Massachusetts, Division on the Necessaries of Life, and Association of American Railroads.
[7] Ore and Coal Exchange, Cleveland, Ohio.
[8] Lake Superior Area Office, Corps of Engineers, U.S. Army, Duluth, Minn.

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TABLE 2.—Statistical summary of monthly developments

(Net tons, except as

	January	February	March	April	May	June
Production (including mine fuel, local sales, and dredge coal)	1,799,000	1,529,000	1,489,000	1,195,000	1,524,000	1,455,000
Shipments (breakers and washeries only, all sizes):						
By rail [1]	815,525	714,906	794,080	695,570	898,831	938,762
By truck [2]	1,006,651	904,393	727,823	508,102	574,556	548,756
Carloadings [3]	14,983	12,598	14,805	14,754	16,616	17,661
Distribution:						
Lake Erie loadings [4]				4,927	16,360	22,958
Lake Ontario loadings [4]						
Receipts at Duluth-Superior [5]						4,794
Upper Lake dock trade: [6]						
Receipts:						
Lake Superior						
Lake Michigan	255	1,205	449	2,785	11,845	168
Deliveries (reloadings):						
Lake Superior	2,443	625	156	20	264	951
Lake Michigan	3,236	2,348	2,079	2,563	976	1,324
New England receipts: By rail [7]	42,974	30,190	35,726	13,468	33,214	52,723
Exports [8]	70,023	184,286	265,847	194,986	339,699	286,208
Imports [8]	686	384	297	622	898	1,009
Industrial consumption and stocks by:						
Electric utilities: [10]						
Consumption	187,010	170,906	153,058	171,564	165,076	170,820
Stocks	1,341,730	1,280,141	1,266,654	1,284,739	1,288,128	1,272,054
Coke plants:						
Used for carbonizing	37,499	36,321	42,948	35,527	38,885	36,244
Stocks	99,088	73,173	51,011	44,880	40,473	55,515
Stocks on Upper Lake docks: [6]						
Lake Superior	9,344	8,719	8,562	8,584	8,320	7,369
Lake Michigan	5,913	4,770	3,140	3,794	14,669	13,513
Stocks in retail dealer yards [11]	439,000	340,000	345,000	322,000	427,000	557,000
Retail dealer deliveries [11]	601,000	544,000	387,000	199,000	189,000	218,000
Wholesale price indexes (1957-59=100): [12] F.o.b. mines:						
Chestnut	97.0	97.0	97.0	84.8	84.8	87.5
Pea	96.5	96.5	96.5	90.1	90.1	91.0
Buckwheat No. 1	96.2	96.2	96.2	89.4	89.4	90.1
Buckwheat No. 3	109.2	109.2	109.2	104.8	104.8	105.5

[1] Furnished by Anthracite Institute.
[2] Pennsylvania Department of Mines and Mineral Industries.
[3] Association of American Railroads.
[4] Ore and Coal Exchange, Cleveland, Ohio.
[5] Lake Superior Area Office, Corps of Engineers, U.S. Army, Duluth, Minn.
[6] Includes all commercial docks on Lake Superior and west shore of Lake Michigan as far south as Kenosha. Data supplied by Upper Lake Docks Coal Bureau, Inc., and direct reports to the Bureau of Mines.
[7] Furnished by Commonwealth of Massachusetts, Division on the Necessaries of Life.
[8] U.S. Department of Commerce. Export data does not include shipments to U.S. military forces.

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in the Pennsylvania anthracite industry in 1963

otherwise indicated)

July	August	September	October	November	December	Year 1963	Change from 1962 (percent)	Year 1962
1,124,000	1,606,000	1,574,000	1,822,000	1,615,000	1,535,000	18,267,000	+8.1	16,894,000
713,122	1,113,514	994,722	1,162,783	990,398	767,187	10,599,400	+15.3	9,193,329
428,887	527,612	613,110	676,370	659,477	794,369	7,970,106	−.4	7,998,196
14,319	21,148	19,404	21,914	18,034	14,304	200,540	+12.0	179,004
8,741	30,603	27,254	45,242	27,189	8,335	191,609	−2.5	196,440
2,950	3,785	7,046	10,699	----------	----------	24,480	−27.0	33,515
----------	5,633	7,278	17,416	----------	----------	35,121	+32.5	26,516
----------	3,110	10,325	5,055	115	----------	18,605	−29.3	26,332
504	1,207	734	503	544	1,161	21,360	+19.6	17,858
11	25	8,115	6,265	2,902	2,669	24,446	−26.8	33,405
1,674	1,497	1,202	1,506	2,041	2,346	22,792	−6.3	24,324
26,604	37,391	30,895	42,378	40,549	35,900	422,012	−14.8	495,390
212,417	420,112	406,583	344,726	319,046	309,259	3,353,192	+86.1	1,801,724
457	272	(9)	(9)	(9)	(9)	(9)	(9)	7,583
181,810	192,772	181,117	200,334	174,637	205,508	2,154,612	−6.2	2,296,849
1,255,014	1,267,221	1,291,356	1,354,112	1,375,586	1,294,129	1,294,129	−9.5	1,430,716
34,058	34,359	35,602	39,188	36,186	43,692	450,509	+7.4	419,520
58,471	71,982	87,493	110,091	121,476	113,620	113,620	−1.5	115,338
7,355	10,940	13,615	12,042	9,255	6,586	6,586	−44.2	11,794
12,343	12,053	11,585	10,607	9,110	7,911	7,911	−11.0	8,894
579,000	639,000	613,000	648,000	649,000	536,000	536,000	+.9	531,000
197,000	271,000	342,000	297,000	325,000	485,000	4,055,000	−14.9	4,767,000
89.0	90.4	94.1	94.1	100.4	100.4	93.0	+2.3	90.9
91.6	93.5	97.7	97.7	101.0	101.0	95.3	+2.7	92.8
90.7	92.1	95.7	95.7	99.7	99.7	94.3	+2.3	92.2
106.0	106.9	108.9	108.9	108.9	108.9	107.6	----------	107.6

[9] Beginning with the month of September, anthracite import data is included with bituminous coal import data.
[10] Federal Power Commission.
[11] Estimated from reports submitted by a selected list of retail dealers. Does not include local sales.
[12] Bureau of Labor Statistics. Based on data obtained from authorized trade publications.

NOTE.—According to the Association of American Railroads, 3,210,156 net tons of anthracite was exported to Europe in 1963, compared with 1,639,846 tons in 1962. Of this total, 860,800 tons was consigned to West Germany, including exports to the U.S. military forces. This compares with 948,847 tons for the same period in 1962.

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TABLE 3.—Statistical trends in the Pennsylvania anthracite industry

	Production (net tons)	Value of production	Average value per net ton	Exports [1] (net tons)	Imports [1] (net tons)	Apparent consumption [2] (net tons)	Average number of employees	Average number of days worked	Average tons per man per day	Average tons per man per year	Quantity cut by machines [3] (net tons)	Quantity produced by stripping [4] (net tons)	Quantity loaded mechanically underground [5] (net tons)
1890	46,468,641	$66,383,772	$1.43	889,655	16,962	45,596,000	126,000	200	1.85	369			
1891	50,665,431	73,944,735	1.46	964,601	42,120	49,743,000	126,350	203	1.98	401			
1892	52,472,504	82,442,000	1.57	953,836	72,865	51,592,000	129,050	198	2.06	407			
1893	53,967,543	85,687,078	1.59	1,493,281	60,220	52,534,000	132,944	197	2.06	406			
1894	51,921,121	78,488,063	1.51	1,613,500	100,876	50,408,000	131,603	190	2.08	395			
1895	57,999,337	82,019,272	1.41	1,647,195	158,297	56,510,000	142,917	196	2.07	406			
1896	54,346,081	81,748,651	1.50	1,512,000	113,892	52,948,000	148,991	174	2.10	365			
1897	52,611,681	79,301,954	1.51	1,454,620	27,478	51,185,000	149,884	150	2.34	351			
1898	53,382,645	75,414,537	1.41	1,513,062	3,527	51,873,000	145,504	152	2.41	367			
1899	60,418,005	88,142,130	1.46	1,912,732	68	58,505,000	139,608	173	2.50	433			
1900	57,367,915	85,757,851	1.49	1,853,163	132	55,515,000	144,206	166	2.40	398			
1901	67,471,667	112,504,020	1.67	2,232,504	320	65,239,000	145,309	196	2.37	464			
1902	41,373,595	76,173,586	1.84	1,016,934	190,636	40,547,000	148,141	116	2.40	279			
1903	74,607,068	152,036,448	2.04	2,249,920	196,837	72,554,000	150,483	206	2.41	496			
1904	73,156,709	138,974,020	1.90	2,495,799	81,232	70,742,000	155,861	200	2.35	469			
1905	77,659,850	141,879,000	1.83	2,497,581	38,350	75,201,000	165,406	215	2.18	470			
1906	71,282,411	131,917,694	1.85	2,483,005	36,236	68,836,000	162,355	195	2.25	439			
1907	85,604,312	163,584,056	1.91	3,021,841	11,085	82,594,000	167,234	220	2.33	512			
1908	83,268,754	158,178,849	1.90	3,082,641	18,462	80,205,000	174,174	200	2.39	478			
1909	81,070,359	149,181,587	1.84	3,183,840	3,574	77,890,000	[6] 171,195	205	[7] 2.31	[7] 474			
1910	84,485,236	160,275,302	1.90	3,384,222	9,180	81,110,000	169,497	229	2.17	498			
1911	90,464,067	175,189,392	1.94	3,980,479	2,759	86,486,000	172,585	246	2.13	524	69,907		
1912	84,361,598	177,622,626	2.11	4,131,444	1,870	80,232,000	174,030	231	2.10	485	246,216		
1913	91,524,922	195,181,127	2.13	4,652,912	1,004	85,474,000	175,745	257	2.02	520	555,776		
1914	90,821,507	188,181,399	2.07	4,289,873	17,696	84,041,000	179,679	245	2.06	505	916,596		
1915	88,995,061	184,653,498	2.07	3,965,255	814	88,144,000	176,552	230	2.19	504	1,307,756	1,121,603	
1916	87,578,493	202,009,561	2.31	4,665,530	6,000	87,118,000	159,869	253	2.16	548	1,839,506	1,987,800	
1917	99,611,811	283,650,723	2.85	6,007,306	13,000	94,068,000	154,174	285	2.27	646	1,955,223	2,301,588	
1918	98,826,084	336,480,347	3.40	4,967,808	37,272	92,775,000	147,121	293	2.29	672	1,857,514	2,360,183	
1919	88,092,201	364,926,950	4.14	4,976,598	82,818	81,518,000	154,571	266	2.14	570	1,575,205	2,006,879	
1920	89,598,249	434,252,198	4.85	5,403,749	31,748	85,786,000	145,074	271	2.28	618	938,073	2,054,441	
1921	90,473,451	452,304,903	5.00	4,677,368	8,894	81,950,000	159,499	271	2.09	567	979,145	2,027,790	
1922	54,683,022	273,700,125	5.01	2,649,457	233,528	56,799,000	156,849	151	2.31	349	502,793	949,745	
1923	93,339,009	506,786,768	5.43	5,090,138	300,360	86,914,000	157,743	268	2.21	592	1,208,542	2,263,098	
1924	87,926,862	477,230,852	5.43	4,017,785	117,951	80,717,000	160,009	274	2.00	550	1,423,884	1,865,677	
1925	61,817,149	327,664,512	5.30	3,179,006	382,894	64,061,000	160,312	182	2.12	386	941,189	1,578,478	
1926	84,437,452	474,164,252	5.62	4,029,683	813,956	77,221,000	165,386	244	2.09	511	931,650	2,401,356	

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1927	80,095,564	420,941,726	5.26	3,325,507	119,030	74,672,000	165,259	225	2.15	485	1,171,888	2,153,156	[6] 2,223,281
1928	75,348,069	393,637,690	5.22	3,336,272	384,707	73,650,000	160,681	217	2.17	469	1,289,809	2,422,924	[6] 2,351,074
1929	73,828,195	385,642,751	5.22	3,406,369	487,172	71,457,000	151,501	225	2.16	487	1,159,910	1,911,766	3,470,158
1930	69,384,837	354,574,191	5.11	2,551,659	674,812	67,628,000	150,804	208	2.21	460	1,410,123	2,536,288	4,467,750
1931	59,645,652	296,354,586	4.97	1,778,308	637,951	58,408,000	139,431	181	2.37	428	1,587,265	3,813,237	4,384,780
1932	49,855,221	222,375,129	4.46	1,303,355	607,097	50,500,000	121,243	162	2.54	411	1,674,223	3,980,973	5,433,340
1933	49,541,344	206,718,405	4.17	1,034,562	456,252	49,600,000	104,633	182	2.60	473	1,648,249	4,932,069	6,557,267
1934	57,168,291	244,152,245	4.27	1,297,610	478,118	55,500,000	109,050	207	2.53	524	1,981,088	5,798,138	9,284,486
1935	52,158,783	210,130,565	4.03	1,608,549	571,439	51,100,000	103,269	189	2.68	505	1,848,095	5,187,072	9,279,057
1936	54,579,535	227,003,538	4.16	1,678,024	614,639	53,200,000	102,081	192	2.79	535	2,162,744	6,203,267	10,827,946
1937	51,856,433	197,598,849	3.81	1,914,173	395,737	50,400,000	99,085	189	2.77	523	1,984,512	5,696,018	10,683,837
1938	46,099,027	180,600,167	3.92	1,908,911	362,895	45,200,000	96,417	171	2.79	478	1,588,407	5,095,341	10,151,669
1939	51,487,377	187,175,324	3.64	2,590,000	298,153	49,700,000	93,138	183	3.02	553	1,881,884	5,486,479	11,773,833
1940	51,484,640	205,489,814	3.99	2,667,632	135,436	49,000,000	91,313	186	3.02	562	1,816,483	6,352,700	12,326,000
1941	[5] 56,368,267	240,275,126	4.26	3,380,189	74,669	52,700,000	88,054	203	[9] 3.04	617	1,855,422	7,316,574	13,441,987
1942	[5] 60,327,729	271,673,380	4.50	4,438,588	140,115	56,500,000	82,121	239	[9] 2.95	705	2,285,640	9,070,933	14,741,459
1943	[5] 60,643,620	306,816,018	5.06	4,138,680	166,020	57,100,000	79,153	270	[9] 2.78	751	1,624,883	8,989,387	14,745,793
1944	[5] 63,701,363	354,582,884	5.57	4,185,933	11,847	59,400,000	77,591	292	[9] 2.79	815	1,336,082	10,953,030	14,975,146
1945	[5] 54,933,909	323,944,435	5.90	3,691,247	149	51,600,000	72,842	269	[9] 2.79	751	1,210,171	10,056,325	13,927,955
1946	[5] 60,506,873	413,417,070	6.83	6,497,245	9,556	53,900,000	78,145	271	[9] 2.84	770	1,232,828	12,858,930	15,619,162
1947	[5] 57,190,009	413,019,486	7.22	8,509,995	10,350	48,200,000	78,600	259	[9] 2.78	720	1,209,983	12,603,545	16,054,011
1948	[5] 57,139,948	467,051,800	8.17	6,675,914	945	50,200,000	76,215	265	[9] 2.81	745	1,016,757	13,352,874	15,742,368
1949	[5] 42,701,724	358,008,451	8.38	4,942,670	----------	37,700,000	75,377	195	[9] 2.87	560	557,599	10,376,808	11,858,088
1950	[5] 44,076,703	392,398,006	8.90	3,891,569	18,289	39,900,000	72,624	211	[9] 2.83	597	611,734	11,833,934	12,335,650
1951 [10]	42,669,997	405,817,963	9.51	5,955,535	26,812	37,000,000	68,995	208	2.97	618	496,085	11,135,990	10,847,787
1952	40,582,558	379,714,076	9.36	4,592,060	29,370	35,300,000	65,923	201	3.06	615	386,128	10,696,705	10,034,464
1953	30,949,152	299,139,687	9.67	2,724,270	31,443	28,000,000	57,862	163	3.28	535	318,699	8,606,482	6,838,769
1954	29,083,477	247,870,023	8.52	2,851,239	5,831	26,900,000	43,996	164	4.02	659	381,424	7,939,680	6,978,035
1955	26,204,554	206,096,662	7.86	3,152,313	170	23,600,000	[11] 33,523	[11] 197	[11] 3.96	[11] 780	393,932	7,703,907	6,660,939
1956	28,900,220	236,785,062	8.19	5,244,349	46	24,000,000	31,516	216	4.25	918	400,402	8,354,230	7,308,110
1957	25,338,321	227,753,802	8.99	4,331,785	1,138	20,800,000	30,825	196	4.18	819	292,307	7,543,157	6,657,479
1958	21,171,142	187,898,316	8.88	2,279,859	4,363	19,000,000	26,540	183	4.36	798	184,028	6,877,761	5,332,043
1959	20,649,286	172,319,913	8.35	1,787,558	2,633	18,800,000	23,294	173	5.12	886	260,502	7,096,343	4,700,542
1960	18,817,441	147,116,250	7.82	1,430,156	1,476	17,600,000	19,051	176	5.60	986	225,520	7,112,288	4,044,392
1961	17,446,439	140,337,541	8.04	1,435,335	792	15,900,000	15,792	196	5.63	1,103	236,166	7,246,646	3,377,778
1962	16,893,646	134,093,874	7.94	[12] 1,801,724	7,583	[12] 14,300,000	14,010	204	5.92	1,208	277,537	6,822,207	3,065,364
1963	18,267,384	153,503,442	8.40	3,353,192	[13] 4,625	14,200,000	13,498	216	6.27	1,354	240,427	7,467,842	3,665,962

[1] U.S. Department of Commerce. Export data for 1961–63 does not include shipments to U.S. military forces. See NOTE, tables 2 and 35.
[2] Before 1913 and after 1961 the figures of consumption take no account of producers, tocks, there being no data available for this item.
[3] Data first collected in 1911.
[4] Data first collected in 1915.
[5] Data first collected in 1929.
[6] As reported by the Commonwealth of Pennsylvania, Department of Mines.
[7] Calculated on basis of Pennsylvania Department of Mines employment data.
[8] Includes some bootleg coal purchased by authorized operators and prepared at heir breakers.
[9] Output per man calculated on authorized tonnages only; bootleg purchases excluded.
[10] Figures for 1951 and subsequent years are not strictly comparable with previous years. See Production and Employment sections, Coal—Pennsylvania Anthracite, Minerals Yearbook, 1951.
[11] Estimated.
[12] Revised.
[13] For period January-August. Beginning with September, anthracite import data is included with bituminous.

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SCOPE OF REPORT

Data in this chapter refer only to anthracite, or hard coal, produced in the northeastern part of the Commonwealth of Pennsylvania. Production of anthracitic, or semianthracitic, coals of Arkansas, Colorado, New Mexico, Virginia, and Washington is included with bituminous coal and lignite in the Bituminous Coal and Lignite chapter of the Bureau of Mines Minerals Yearbook. The anthracite producing region is divided geologically into four fields. The Northern, Eastern Middle, Western Middle, and Southern. The area is also grouped by coal-trade usage into three regions: The Wyoming, which is coextensive with the Northern field; the Lehigh, which includes the Eastern Middle field and that portion of the Southern lying east of Tamaqua; and the Schuylkill, which encompasses all of the Western Middle field and that part of the Southern field west of Tamaqua.

Bureau statistics on production, value, and transportation methods are compiled almost entirely from reports submitted voluntarily by operators of preparation plants and dredges. Estimates are prepared on unreported tonnage from data published by the Pennsylvania Department of Mines and Mineral Industries and other sources. Questionnaires are also sent to operators of underground mines not equipped with preparation facilities and to contractors engaged either in strip mining or in reclaiming culm and silt banks. From these reports information is obtained on run-of-mine production, names of plants to which the raw coal is shipped for preparation, types of mining equipment used, and the counties, fields, and regions in which the run-of-mine production originated. These reports are used also to eliminate duplicate reporting and to maximize the coverage obtained.

Beginning with calendar year 1961, Bureau production data have been presented by carrier method (rail and truck), rather than as shipments to points inside (local sales) and outside the producing region. Also, since 1956, statistics on employment in the Pennsylvania anthracite industry have been compiled from the Bureau of Mines questionnaire, Mine Injuries and Employment—Pennsylvania Anthracite, to lessen the reporting burden of respondents. Bureau employment data include production, development, maintenance, supervisory, shop, and technical personnel, plus partners or firm members who perform duties directly related to coal production. Sales and office workers and others not connected with production are excluded.

Summarized distribution data appearing in table 29 are collected by the Bureau from producers, wholesalers, and dock operators by coal year (April 1–March 31) rather than calendar year, because the former conforms more closely to the actual heating season. The complete report presents detailed information on shipments by sizes and method of movement to selected markets in the United States and Canada. Copies may be obtained by writing to the Bureau of Mines, U.S. Department of the Interior, Washington, D.C., 20240, or to the Publications Distribution Section, 4800 Forbes Avenue, Pittsburgh, Pa., 15213.

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ACKNOWLEDGMENTS

Because Bureau of Mines canvasses of the Pennsylvania anthracite industry are restricted to such subjects as production by sizes, carrier method, employment, f.o.b. preparation-plant value, injuries, mining equipment, distribution, sources of production, and retail-dealer stocks and deliveries, the author has made free use of relevant data from numerous sources. Although care has been taken to acknowledge each individual source by footnote reference, the Bureau would like to express its thanks to the Pennsylvania Department of Mines and Mineral Industries, the Association of American Railroads, Commonwealth of Massachusetts, Upper Lake Docks Coal Bureau, Inc., the Ore and Coal Exchange, and the Anthracite Institute for their continued cooperation. However, as it would have been patently impossible to prepare this chapter without cooperation from the industry, the Bureau also extends its sincere appreciation to hundreds of producers who voluntarily submitted annual reports on their operations.

Bureau personnel who assisted the author in preparing this chapter for publication are recognized in the acknowledgments section in the forepart of this volume.

PRODUCTION, MINING METHODS, AND EQUIPMENT

Production of Pennsylvania anthracite totaled 18.3 million short tons in 1963, an approximate increase of 1.4 million tons, or 8 percent, over that of 1962. Despite this increase, the first since 1956, underground production showed only a minor gain (less than 1 percent), with virtually all of the increase being attributable to strip-pit and culm-bank coal. As a result, underground production dropped to 37 percent of total production, compared with 40 percent in 1962; strip pits accounted for 41 percent (40 percent in 1962); culm banks, 18 percent (16 percent in 1962); and river coal, 4 percent (the same as in 1962).

Each of the 3 producing regions showed gains in output in 1963. In the Lehigh region, total production exceeded that of 1962 by 16 percent as gains of 10 and 33 percent in production from strip pits and culm and silt banks, respectively, offset a slight decline in underground production. In the Schuylkill, which registered an increase of 9 percent over that of 1962, underground output remained virtually unchanged, but production from both strip pits and banks scored sharp gains. The Wyoming region recorded small increases in output from both underground and stripping operations, but the net gain over 1962 output was held to only 2 percent by a slight decline in the quantity of coal recovered from banks. Owing to the disproportionate increase among the regions, the Wyoming share of total production decreased from 33 percent in 1962 to 32 percent and that of the Lehigh increased 1 point to 20 percent. The Schuylkill contributed 48 percent in each year.

The changes in regional totals were reflected, of course, in those of the major producing counties. For example, the gain of only 2 percent in the Wyoming region was due entirely to a rise of 12 percent in Luzerne County as production in Lackawanna County was approximately 13 percent below the 1962 level. Increased production in the

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Lehigh region was occasioned by gains reported in the totals for Luzerne, Schuylkill, and Columbia Counties that were more than sufficient to nullify the decrease of 4 percent in output of Carbon County. In the Schuylkill region, the production picture for 1963 was featured by increases for each county in the region, led by Dauphin County with a gain of 76 percent over that of 1962 and followed in descending order by Northumberland with 24 percent, Columbia with 6 percent, and Schuylkill with 5 percent. Detailed data on production by counties, regions, and fields are shown in tables 4, 7–9. Figure 1 shows trends in anthracite shipments by regions for 1940–63.

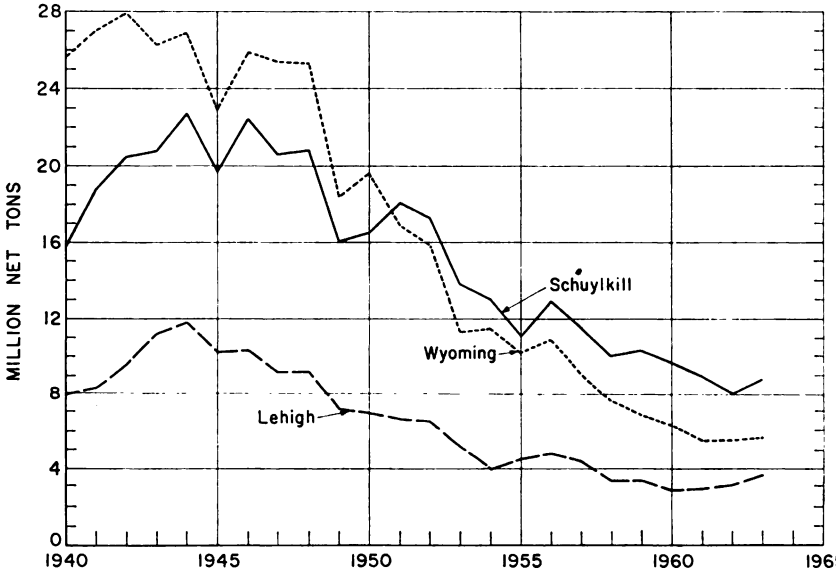

FIGURE 1.—Pennsylvania anthracite shipped from the Lehigh, Schuylkill, and Wyoming regions, 1940–63.

Underground Mines.—Apparently as a result of the strong demand in overseas markets for the larger space-heating sizes, which, in effect, counterbalanced the continuing loss in demand for the same sizes in the United States and Canada, production at deep mines was relatively the same as in 1962, increasing about 42,000 tons—or less than 1 percent. While part of this stability was attributable to continued shipments of egg, stove, and chestnut sizes to U.S. Armed Forces in West Germany (see Foreign Trade section), the severe winter of 1962–63, which depleted stocks on the Continent, caused other European countries to step up sharply their imports of large-sized U.S. anthracite. In the Wyoming region production at underground mines increased about 3 percent (80,000 tons), but declined 27 percent, or 35,000 tons in the Lehigh. Output was virtually unchanged from 1962 in the Schuylkill, decreasing less than 3,000 tons, or less than 1 percent. As a result, the share of total underground production from the Lehigh region dropped to but 1 percent of the total for the year, with 54 percent being mined in the Schuylkill region (the same as in 1962) and 45 percent in the Wyoming (44 percent in 1962).

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Statistics on production by source, fields, and regions are presented in tables 10 and 11. Production trends are presented graphically, by source, in figures 2 and 3.

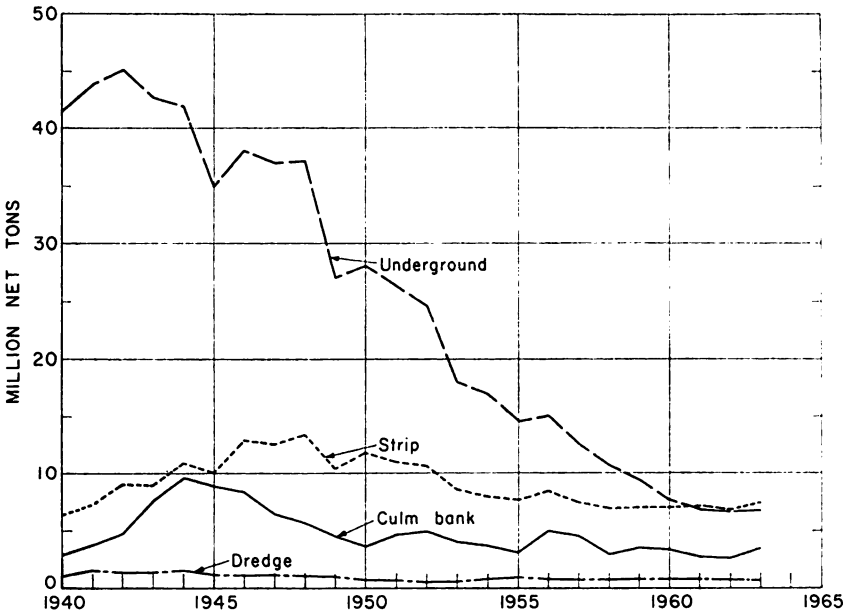

FIGURE 2.—Production of Pennsylvania anthracite, by sources, 1940–63.

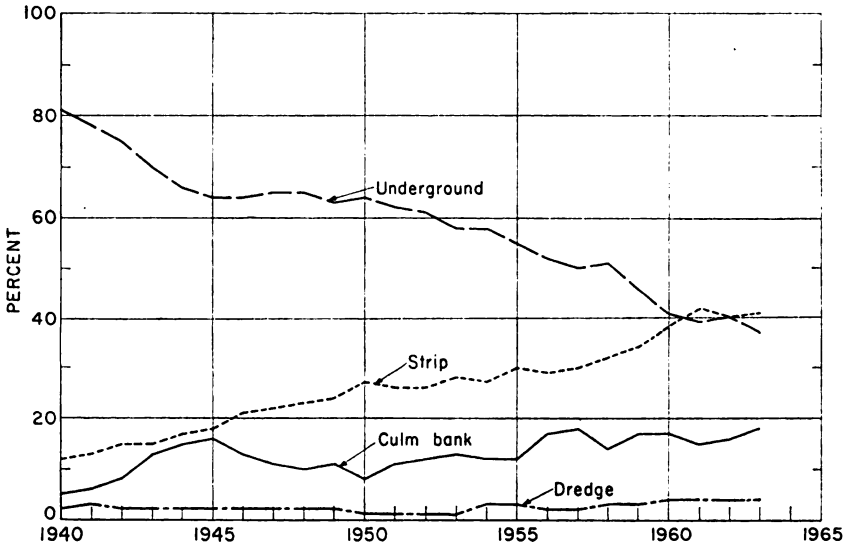

FIGURE 3.—Production of Pennsylvania anthracite, by sources, 1940–63, in percent of total.

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TABLE 4.—Commercial production of Pennsylvania anthracite in 1963, by regions and sizes

Size	From preparation plants								
	Lehigh region			Schuylkill region			Wyoming region [1]		
	Rail	Truck	Total	Rail	Truck	Total	Rail	Truck	Total
Net tons:									
Lump [2] and broken				128	549	677	862	62	924
Egg	78,255	6,011	84,266	82,744	4,596	87,340	273,031	6,048	279,079
Stove	253,503	99,120	352,623	437,009	526,580	963,589	720,199	221,075	941,274
Chestnut	157,139	269,650	426,789	472,500	744,973	1,217,473	581,871	462,788	1,044,659
Pea	85,111	283,103	368,214	328,786	507,095	835,881	266,009	520,990	786,999
Total pea and larger	574,008	657,884	1,231,892	1,321,167	1,783,793	3,104,960	1,841,972	1,210,963	3,052,935
Buckwheat No. 1	123,685	217,091	340,776	457,241	544,692	1,001,933	382,707	473,423	856,130
Buckwheat No. 2 (rice)	73,600	242,922	316,522	254,210	531,717	785,927	193,176	330,534	523,710
Buckwheat No. 3 (barley)	161,031	197,820	358,851	333,241	573,797	907,038	393,305	221,289	614,594
Buckwheat No. 4	210,052	75,845	285,897	289,681	264,000	553,681	109,501	23,673	133,174
Buckwheat No. 5	540,330	72,381	612,711	778,749	255,693	1,034,442	165,473	63,699	229,172
Other [3]	230,997	272,320	503,317	387,522	338,239	725,761		241,942	241,942
Total buckwheat No. 1 and smaller	1,339,695	1,078,379	2,418,074	2,500,644	2,508,138	5,008,782	1,244,162	1,354,560	2,598,722
Grand total	1,913,703	1,736,263	3,649,966	3,821,811	4,291,931	8,113,742	3,086,134	2,565,523	5,651,657
Value:									
Lump [2] and broken				$1,615	$6,932	$8,547	$10,103	$727	$10,830
Egg	$920,942	$69,085	$990,027	979,146	51,936	1,031,082	3,328,031	73,678	3,401,709
Stove	3,091,997	1,239,560	4,331,557	5,288,644	6,201,216	11,489,860	8,926,660	2,761,667	11,688,327
Chestnut	1,922,227	3,367,026	5,289,253	5,675,004	8,765,155	14,440,159	7,305,585	5,878,337	13,183,922
Pea	804,901	2,835,850	3,640,751	3,168,791	4,877,541	8,046,332	2,816,588	5,707,632	8,524,220
Total pea and larger	6,740,067	7,511,521	14,251,588	15,113,200	19,902,780	35,015,980	22,386,967	14,422,041	36,809,008
Buckwheat No. 1	1,023,525	1,960,970	2,984,495	4,020,893	4,771,738	8,792,631	3,501,193	4,638,166	8,139,359
Buckwheat No. 2 (rice)	629,241	2,298,443	2,927,684	2,160,669	4,620,477	6,781,146	1,776,940	3,152,115	4,929,055
Buckwheat No. 3 (barley)	1,058,802	1,358,611	2,417,413	2,199,457	3,852,493	6,051,950	2,541,215	1,470,438	4,011,653
Buckwheat No. 4	1,032,950	388,780	1,421,730	1,368,712	1,234,021	2,602,733	626,395	119,553	745,948

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Buckwheat No. 5	2,640,985	335,803	2,976,788	3,343,546	920,138	4,263,684	784,080	308,461	1,092,541
Other [3]	723,739	784,975	1,508,714	1,277,436	1,080,395	2,357,831		463,742	463,742
Total buckwheat No. 1 and smaller	7,109,242	7,127,582	14,236,824	14,370,713	16,479,262	30,849,975	9,229,823	10,152,475	19,382,298
Grand total	13,849,309	14,639,103	28,488,412	29,483,913	36,382,042	65,865,955	31,616,790	24,574,516	56,191,306
Average value per ton:									
Lump [2] and broken				$12.62	$12.63	$12.62	$11.72	$11.73	$11.72
Egg	$11.77	$11.49	$11.75	11.83	11.30	11.81	12.19	12.18	12.19
Stove	12.20	12.51	12.28	12.10	11.78	11.92	12.39	12.49	12.42
Chestnut	12.23	12.49	12.39	12.01	11.77	11.86	12.56	12.70	12.62
Pea	9.46	10.02	9.89	9.64	9.62	9.63	10.59	10.96	10.83
Total pea and larger	11.74	11.42	11.57	11.44	11.16	11.28	12.15	11.91	12.06
Buckwheat No. 1	8.28	9.03	8.76	8.79	8.76	8.78	9.15	9.80	9.51
Buckwheat No. 2 (rice)	8.55	9.46	9.25	8.50	8.69	8.63	9.20	9.54	9.41
Buckwheat No. 3 (barley)	6.58	6.87	6.74	6.60	6.71	6.67	6.46	6.64	6.53
Buckwheat No. 4	4.92	5.13	4.97	4.72	4.67	4.70	5.72	5.05	5.60
Buckwheat No. 5	4.89	4.64	4.86	4.29	3.60	4.12	4.74	4.84	4.77
Other [3]	3.13	2.88	3.00	3.30	3.19	3.25		1.92	1.92
Total buckwheat No. 1 and smaller	5.31	6.61	5.89	5.75	6.57	6.16	7.42	7.50	7.46
Grand total	7.24	8.43	7.81	7.71	8.48	8.12	10.24	9.58	9.94

See footnotes at end of table.

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TABLE 4.—Commercial production of Pennsylvania anthracite in 1963, by regions and sizes—Continued

Size	Total preparation plants			From river dredging			Total		
	Rail	Truck	Total	Rail	Truck	Total	Rail	Truck	Total
Net tons:									
Lump [3] and broken	990	611	1,601				990	611	1,601
Egg	434,030	16,655	450,685				434,030	16,655	450,685
Stove	1,410,711	846,775	2,257,486				1,410,711	846,775	2,257,486
Chestnut	1,211,510	1,477,411	2,688,921				1,211,510	1,477,411	2,688,921
Pea	679,906	1,311,188	1,991,094				679,906	1,311,188	1,991,094
Total pea and larger	3,737,147	3,652,640	7,389,787				3,737,147	3,652,640	7,389,787
Buckwheat No. 1	963,633	1,235,206	2,198,839		121	121	963,633	1,235,327	2,198,960
Buckwheat No. 2 (rice)	520,986	1,105,173	1,626,159		235	235	520,986	1,105,408	1,626,394
Buckwheat No. 3 (barley)	887,577	992,906	1,880,483		3,515	3,515	887,577	996,421	1,883,998
Buckwheat No. 4	609,234	363,518	972,752		20,774	20,774	609,234	384,292	993,526
Buckwheat No. 5	1,484,552	391,773	1,876,325	18,000	89,724	107,724	1,502,552	481,497	1,984,049
Other [3]	618,519	852,501	1,471,020	547,758	11,243	559,001	1,166,277	863,744	2,030,021
Total buckwheat No. 1 and smaller	5,084,501	4,941,077	10,025,578	565,758	125,612	691,370	5,650,259	5,066,689	10,716,948
Grand total	8,821,648	8,593,717	17,415,365	565,758	125,612	691,370	9,387,406	8,719,329	18,106,735
Value:									
Lump [3] and broken	$11,718	$7,659	$19,377				$11,718	$7,659	$19,377
Egg	5,228,119	194,699	5,422,818				5,228,119	194,699	5,422,818
Stove	17,307,301	10,202,443	27,509,744				17,307,301	10,202,443	27,509,744
Chestnut	14,902,816	18,010,518	32,913,334				14,902,816	18,010,518	32,913,334
Pea	6,790,280	13,421,023	20,211,303				6,790,280	13,421,023	20,211,303
Total pea and larger	44,240,234	41,836,342	86,076,576				44,240,234	41,836,342	86,076,576
Buckwheat No. 1	8,545,611	11,370,874	19,916,485		$847	$847	8,545,611	11,371,721	19,917,332
Buckwheat No. 2 (rice)	4,566,850	10,071,035	14,637,885		1,880	1,880	4,566,850	10,072,915	14,639,765
Buckwheat No. 3 (barley)	5,799,474	6,681,542	12,481,016		15,905	15,905	5,799,474	6,697,447	12,496,921
Buckwheat No. 4	3,028,057	1,742,354	4,770,411		90,553	90,553	3,028,057	1,832,907	4,860,964
Buckwheat No. 5	6,768,611	1,564,402	8,333,013	$66,500	279,097	345,597	6,835,111	1,843,499	8,678,610
Other [3]	2,001,175	2,329,112	4,330,287	1,973,169	40,070	2,013,239	3,974,344	2,369,182	6,343,526
Total buckwheat No. 1 and smaller	30,709,778	33,759,319	64,469,097	2,039,669	428,352	2,468,021	32,749,447	34,187,671	66,937,118
Grand total	74,950,012	75,595,661	150,545,673	2,039,669	428,352	2,468,021	76,989,681	76,024,013	153,013,694

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Average value per ton:									
Lump [2] and broken	$11.84	$12.54	$12.10	----------	----------	----------	$11.84	$12.54	$12.10
Egg	12.05	11.69	12.03	----------	----------	----------	12.05	11.69	12.03
Stove	12.27	12.05	12.19	----------	----------	----------	12.27	12.05	12.19
Chestnut	12.30	12.19	12.24	----------	----------	----------	12.30	12.19	12.24
Pea	9.99	10.24	10.15	----------	----------	----------	9.99	10.24	10.15
Total pea and larger	11.84	11.45	11.65	----------	----------	----------	11.84	11.45	11.65
Buckwheat No. 1	8.87	9.21	9.06	----------	$7.00	$7.00	8.87	9.21	9.06
Buckwheat No. 2 (rice)	8.77	9.11	9.00	----------	8.00	8.00	8.77	9.11	9.00
Buckwheat No. 3 (barley)	6.53	6.73	6.64	----------	4.52	4.52	6.53	6.72	6.63
Buckwheat No. 4	4.97	4.79	4.90	----------	4.36	4.36	4.97	4.77	4.89
Buckwheat No. 5	4.56	3.99	4.44	$3.69	3.11	3.21	4.55	3.83	4.37
Other [3]	3.24	2.73	2.94	3.60	3.56	3.60	3.41	2.74	3.12
Total buckwheat No. 1 and smaller	6.04	6.83	6.43	3.61	3.41	3.57	5.80	6.75	6.25
Grand total	8.50	8.80	8.64	3.61	3.41	3.57	8.20	8.72	8.45

[1] Includes Sullivan County.
[2] Quantity of lump included is insignificant.
[3] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low dollar value.

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TABLE 5.—Sizes of Pennsylvania anthracite prepared at plants in 1963, by regions, in percent of total

(Excludes dredge coal)

Size	Lehigh region			Schuylkill region		
	Shipped by rail	Shipped by truck	Total	Shipped by rail	Shipped by truck	Total
Lump [1] and broken				[2]	[2]	[2]
Egg	4.1	0.4	2.3	2.2	0.1	1.1
Stove	13.2	5.7	9.7	11.4	12.3	11.9
Chestnut	8.2	15.5	11.7	12.4	17.4	15.0
Pea	4.5	16.3	10.1	8.6	11.8	10.3
Total pea and larger	30.0	37.9	33.8	34.6	41.6	38.3
Buckwheat No. 1	6.5	12.5	9.3	12.0	12.7	12.3
Buckwheat No. 2 (rice)	3.8	14.0	8.7	6.6	12.4	9.7
Buckwheat No. 3 (barley)	8.4	11.4	9.8	8.7	13.4	11.2
Buckwheat No. 4	11.0	4.3	7.8	7.6	6.1	6.8
Buckwheat No. 5	28.2	4.2	16.8	20.4	5.9	12.8
Other [3]	12.1	15.7	13.8	10.1	7.9	8.9
Total buckwheat No. 1 and smaller	70.0	62.1	66.2	65.4	58.4	61.7
	Wyoming region [4]			Total		
Lump [1] and broken	[2]	[2]	[2]	[2]	[2]	[2]
Egg	8.9	0.2	4.9	4.9	0.2	2.6
Stove	23.3	8.6	16.7	16.0	9.8	13.0
Chestnut	18.9	18.1	18.5	13.8	17.2	15.4
Pea	8.6	20.3	13.9	7.7	15.3	11.4
Total pea and larger	59.7	47.2	54.0	42.4	42.5	42.4
Buckwheat No. 1	12.4	18.5	15.1	10.9	14.4	12.6
Buckwheat No. 2 (rice)	6.3	12.9	9.3	5.9	12.9	9.3
Buckwheat No. 3 (barley)	12.7	8.6	10.9	10.1	11.5	10.8
Buckwheat No. 4	3.5	.9	2.4	6.9	4.2	5.6
Buckwheat No. 5	5.4	2.5	4.0	16.8	4.6	10.8
Other [3]		9.4	4.3	7.0	9.9	8.5
Total buckwheat No. 1 and smaller	40.3	52.8	46.0	57.6	57.5	57.6

[1] Quantity of lump included is insignificant.
[2] Less than 0.05 percent.
[3] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low value.
[4] Includes Sullivan County.

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TABLE 6.—Sizes of Pennsylvania anthracite prepared at plants, by regions, in percent of total

(Excludes dredge coal)

Size	Lehigh region					Schuylkill region				
	1959	1960	1961	1962	1963	1959	1960	1961	1962	1963
Lump [1] and broken	0.1	------	(2)	------	------	0.1	0.1	(2)	(2)	(2)
Egg	.9	0.9	1.8	3.1	2.3	.6	.5	0.6	0.9	1.1
Stove	11.4	11.5	11.6	10.7	9.7	12.3	11.8	12.0	12.2	11.9
Chestnut	15.1	15.4	15.9	12.5	11.7	15.5	15.3	15.8	15.4	15.0
Pea	11.4	11.1	11.2	10.8	10.1	10.0	10.1	10.3	10.7	10.3
Total pea and larger	38.9	38.9	40.5	37.1	33.8	38.5	37.8	38.7	39.2	38.3
Buckwheat No. 1	11.6	10.8	12.3	11.0	9.3	12.8	12.1	11.7	12.4	12.3
Buckwheat No. 2 (rice)	9.1	8.6	8.9	8.6	8.7	9.1	9.5	9.2	9.5	9.7
Buckwheat No. 3 (barley)	9.0	9.0	10.2	8.8	9.8	12.7	13.2	12.0	11.1	11.2
Buckwheat No. 4	7.4	7.3	9.0	6.8	7.8	6.4	7.3	7.2	7.2	6.8
Buckwheat No. 5	10.4	10.9	11.1	10.6	16.8	10.6	11.6	10.8	12.7	12.8
Other [3]	13.6	14.5	8.0	17.1	13.8	9.9	8.5	10.4	7.9	8.9
Total buckwheat No. 1 and smaller	61.1	61.1	59.5	62.9	66.2	61.5	62.2	61.3	60.8	61.7

Size	Wyoming region [4]					Total				
	1959	1960	1961	1962	1963	1959	1960	1961	1962	1963
Lump [1] and broken	0.1	0.1	0.1	(2)	(2)	0.1	0.1	0.1	(2)	(2)
Egg	.8	.7	1.9	4.4	4.9	.7	.6	1.2	2.5	2.6
Stove	17.0	14.7	15.3	15.8	16.7	13.8	12.8	13.0	13.2	13.0
Chestnut	20.8	19.8	20.2	17.7	18.5	17.3	16.9	17.3	15.6	15.4
Pea	14.8	14.0	14.5	13.8	13.9	11.9	11.6	11.8	11.8	11.4
Total pea and larger	53.5	49.3	52.0	51.7	54.0	43.8	42.0	43.4	43.1	42.4
Buckwheat No. 1	15.4	16.0	15.1	15.1	15.1	13.5	13.3	12.9	13.1	12.6
Buckwheat No. 2 (rice)	9.4	9.2	9.4	9.1	9.3	9.2	9.2	9.2	9.2	9.3
Buckwheat No. 3 (barley)	11.3	10.9	11.3	10.5	10.9	11.6	11.8	11.5	10.5	10.8
Buckwheat No. 4	2.6	2.2	3.0	2.3	2.4	5.2	5.5	6.1	5.4	5.6
Buckwheat No. 5	2.3	3.3	4.3	4.8	4.0	7.7	8.6	8.7	9.5	10.8
Other [3]	5.5	9.1	4.9	6.5	4.3	9.0	9.6	8.2	9.2	8.5
Total buckwheat No. 1 and smaller	46.5	50.7	48.0	48.3	46.0	56.2	58.0	56.6	56.9	57.6

[1] Quantity of lump included is insignificant.
[2] Less than 0.05 percent.
[3] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low value.
[4] Includes Sullivan County.

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TABLE 7.—Production of Pennsylvania anthracite in 1963, by regions

Region	Production							
	Rail shipments		Truck shipments		Colliery fuel		Total	
	Net tons	Value [1]	Net tons	Value [1]	Net tons	Value	Net tons	Value [1]
Lehigh: Preparation plants	1,913,703	13,849,309	1,736,263	14,639,103	14,581	81,244	3,664,547	28,569,656
Schuylkill:								
Preparation plants	3,821,811	29,483,913	4,291,931	36,382,042	7,641	59,582	8,121,383	65,925,537
Dredges	565,758	2,039,669	125,612	428,352	360	1,080	691,730	2,469,101
Total Schuylkill	4,387,569	31,523,582	4,417,543	36,810,394	8,001	60,662	8,813,113	68,394,638
Wyoming: Preparation plants [2]	3,086,134	31,616,790	2,565,523	24,574,516	138,067	347,842	5,789,724	56,539,148
Total:								
Preparation plants	8,821,648	74,950,012	8,593,717	75,595,661	160,289	488,668	17,575,654	151,034,341
Dredges	565,758	2,039,669	125,612	428,352	360	1,080	691,730	2,469,101
Grand total	9,387,406	76,989,681	8,719,329	76,024,013	160,649	489,748	18,267,384	153,503,442

[1] Value given for shipments is that at which coal left possession of producing company; does not include selling expenses.
[2] Includes Sullivan County.

TABLE 8.—Pennsylvania anthracite produced, 1959–63, by fields, in net tons

Field	1959	1960	1961	1962	1963
Eastern Middle: Breakers and washeries	1,915,788	2,121,500	2,002,163	2,257,038	2,657,499
Western Middle:					
Breakers and washeries	5,813,868	5,104,897	4,673,983	3,723,273	4,270,454
Dredges	65,683	71,828	58,287	41,105	36,095
Total	5,879,551	5,176,725	4,732,270	3,764,378	4,306,549
Southern:					
Breakers and washeries	5,269,930	4,530,628	4,486,037	4,515,339	4,857,977
Dredges	650,936	640,335	687,561	685,946	655,635
Total	5,920,866	5,170,963	5,173,598	5,201,285	5,513,612
Northern: Breakers and washeries [1]	6,933,081	6,348,253	5,538,408	5,670,945	5,789,724
Total:					
Breakers and washeries	19,932,667	18,105,278	16,700,591	16,166,595	17,575,654
Dredges	716,619	712,163	745,848	727,051	691,730
Grand total	20,649,286	18,817,441	17,446,439	16,893,646	18,267,384

[1] Includes Sullivan County.

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TABLE 9.—Production of Pennsylvania anthracite in 1963, by counties

County	Production							
	Rail shipments		Truck shipments		Colliery fuel		Total	
	Net tons	Value [1]	Net tons	Value [1]	Net tons	Value	Net tons	Value [1]
Berks, Lancaster, and Snyder	544,002	$1,957,706	91,155	$308,216	--	--	635,157	$2,265,922
Carbon	244,323	2,267,799	400,947	3,313,430	--	--	645,270	5,581,229
Columbia	301,423	2,130,134	109,111	998,446	78	$539	410,612	3,129,119
Dauphin	232,361	1,016,771	18,610	82,439	--	--	250,971	1,099,210
Lackawanna	622,325	6,167,435	334,152	3,574,104	2,620	22,582	959,097	9,764,121
Lebanon	20,992	143,643	23,305	123,712	--	--	44,297	267,355
Luzerne	3,464,846	31,462,937	3,141,880	28,424,432	149,593	402,711	6,756,319	60,290,080
Northumberland	729,893	5,081,362	1,288,340	10,621,590	705	3,664	2,018,938	15,706,616
Schuylkill	3,227,241	26,761,894	3,294,260	28,427,604	7,643	60,152	6,529,144	55,249,650
Sullivan	--	--	10,022	66,617	10	100	10,032	66,717
Wayne	--	--	7,547	83,423	--	--	7,547	83,423
Total	9,387,406	76,989,681	8,719,329	76,024,013	160,649	489,748	18,267,384	153,503,442

[1] Value given for shipments is that at which coal left possession of producing company; does not include selling expenses.

TABLE 10.—Pennsylvania anthracite produced in 1963, classified as fresh-mined culm-bank and river coal, by fields, in net tons

Field	Fresh-mined coal				From culm banks	From river dredging	Total
	Underground mines			Strip pits			
	Mechanically loaded	Hand loaded	Total				
Eastern Middle	49,910	19,835	69,745	1,410,600	1,177,154	--	2,657,499
Western Middle	320,545	1,063,156	1,383,701	2,083,043	803,710	36,095	4,306,549
Southern	439,229	1,836,759	2,275,988	1,875,949	706,040	655,635	5,513,612
Northern [1]	2,856,278	129,034	2,985,312	2,098,250	706,162	--	5,789,724
Total	3,665,962	3,048,784	6,714,746	7,467,842	3,393,066	691,730	18,267,384

[1] Includes Sullivan County.

TABLE 11.—Pennsylvania anthracite produced in 1963, classified as fresh-mined, culm-bank, and river coal, by regions, in net tons

Region	Fresh-mined coal				From culm banks	From river dredging	Total
	Underground mines			Strip pits			
	Mechanically loaded	Hand loaded	Total				
Lehigh	49,910	46,719	96,629	2,270,328	1,297,590	--	3,664,547
Schuylkill	759,774	2,873,031	3,632,805	3,099,264	1,389,314	691,730	8,813,113
Wyoming [1]	2,856,278	129,034	2,985,312	2,098,250	706,162	--	5,789,724
Total	3,665,962	3,048,784	6,714,746	7,467,842	3,393,066	691,730	18,267,384

[1] Includes Sullivan County.

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Strip Pits.—The export demand for large sizes was primarily responsible for the 8-percent gain in total production at stripping operations in 1963. Each of the producing regions reported gains over those of 1962. In the Schuylkill region, which has been the leader in this type of mining for many years, strip output ran about 13 percent higher than in 1962. Strip-pit production was approximately 10 percent above 1962 figures in the Lehigh region, but only about 4 percent greater in the Wyoming. Of the total, 42 percent was produced in the Schuylkill, 30 percent in the Lehigh, and 28 percent in the Wyoming region. These data indicate a gain of 2 points in the Schuylkill share of strip-mined coal, a loss of 2 points for the Wyoming region, and the same (30 percent) for the Lehigh in both years.

As deep mining has virtually ceased in the Lehigh region, 96 percent of its fresh-mined production (strip plus underground) was produced at stripping operations in 1963, and only 4 percent at underground mines. The percentages were unchanged in the Wyoming, with 41 percent of the 1963 regional total being fresh mined produced at strip pits and 59 percent underground; however, in the Schuylkill region strip coal rose to 46 percent of the total as deep-mined coal dropped from 57 percent in 1962 to 54 percent in 1963. Table 12 shows detailed data on strip-pit production for selected years in the period 1915–63, and figure 4 shows trends in both regional and total output for 1940–63.

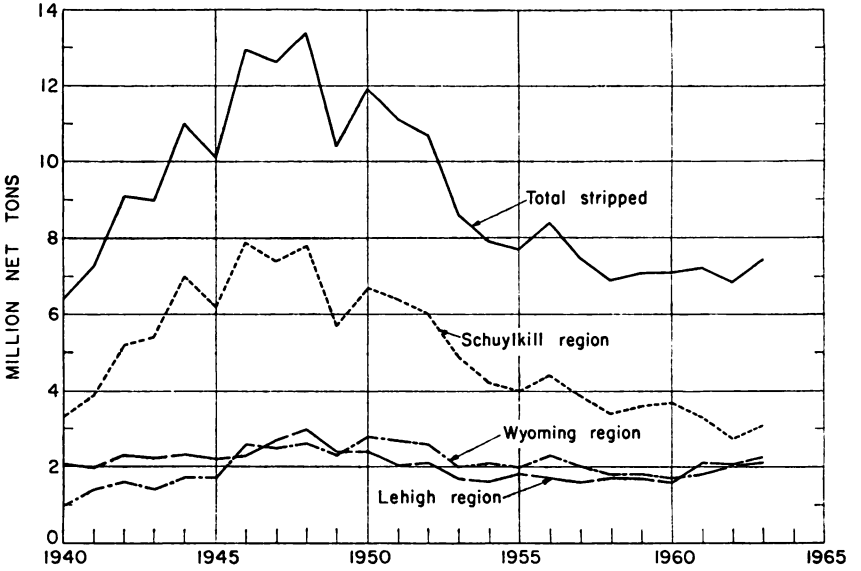

FIGURE 4.—Pennsylvania anthracite mined from strip pits, by regions, 1940–63.

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TABLE 12.—Production of Pennsylvania anthracite from strip pits

	Mined by stripping (net tons)	Percent of fresh-mined total	Number of men employed	Average number of days worked
1915	1,121,603	(1)	(1)	(1)
1920	2,054,441	2.5	(1)	(1)
1925	1,578,478	2.7	(1)	(1)
1930	2,536,288	3.8	(1)	(1)
1956	8,354,230	35.7	4,840	216
1957	7,543,157	37.4	4,546	207
1958	6,877,761	39.1	4,418	196
1959	7,066,343	43.0	3,775	200
1960	7,112,288	48.0	3,470	195
1961	7,246,646	51.6	3,194	207
1962	6,822,207	50.6	3,008	206
1963:				
Lehigh region	2,270,328	95.9	1,144	214
Schuylkill region	3,099,264	46.0	1,152	223
Wyoming region [2]	2,098,250	41.3	729	244
Total	7,467,842	52.7	3,025	224

[1] Data not available.
[2] Includes Sullivan County.

Culm Banks.—After keeping output from culm and silt banks at relatively the same quantity in 1961 and 1962, anthracite producers responded to the increased demand for smaller sizes in both U.S. and foreign markets by stepping up bank production 27 percent in 1963. However, as in past years, no firm regional trends were apparent, because depletion of certain banks and subsequent transferral of operations to other sites caused shifts in regional totals. For example, on one hand, output of bank coal in the Schuylkill region rose 46 percent over that of 1962 and accounted for 41 percent of the 1963 total of culm-bank production; yet, as recently as 1961, the Schuylkill region was responsible for as much as 51 percent of the bank coal produced in that year. On the other hand, the output from banks in the Lehigh region increased from 36 percent of the total in 1962 to 38 perent in 1963. The Wyoming share rose from 24 percent in 1961 to 28 percent in 1962; however, because of a quantitative decline of 5 percent in 1963, its share dropped to only 21 percent. Data on production from culm banks are shown in tables 10, 11, and 13.

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TABLE 13.—Production of Pennsylvania anthracite from culm banks, by regions, in net tons

	Lehigh	Schuylkill	Wyoming	Sullivan County	Total
1935	192,790	1,748,960	760,718	----------	2,702,468
1936	136,058	2,532,116	525,798	----------	3,193,972
1937	101,239	2,178,482	442,878	----------	2,722,599
1938	53,037	1,941,896	345,511	----------	2,340,444
1939	64,180	2,159,548	360,086	----------	2,583,814
1940	192,878	2,109,557	480,603	----------	2,783,038
1941	326,755	2,881,049	449,062	----------	3,656,866
1942	745,934	3,529,757	459,373	----------	4,735,064
1943	1,944,047	4,577,917	1,041,841	19,893	7,583,698
1944	2,125,317	5,787,036	1,673,994	13,833	9,600,180
1945	2,086,864	4,936,907	1,728,440	34,448	8,786,659
1946	1,875,590	4,752,141	1,780,874	22,487	8,431,092
1947	1,044,501	3,947,016	1,409,217	2,912	6,403,646
1948	796,114	3,729,542	1,098,123	----------	5,623,779
1949	694,763	2,778,131	956,250	----------	4,429,144
1950	366,069	2,533,535	565,829	1,877	3,467,310
1951	566,613	3,578,795	484,792	----------	4,630,200
1952	791,445	3,407,974	566,097	----------	4,765,516
1953	714,646	2,792,323	504,031	----------	4,011,000
1954	797,761	2,320,006	447,715	----------	3,565,482
1955	862,539	1,934,492	416,015	----------	3,213,046
1956	1,493,381	2,750,838	530,580	----------	4,774,799
1957	1,457,869	2,479,241	584,300	----------	4,521,410
1958	605,741	1,742,356	550,756	3,900	2,902,753
1959	831,254	1,905,465	[1] 684,135	(1)	3,420,854
1960	825,825	1,563,746	907,441	----------	3,297,012
1961	656,528	1,377,204	635,627	----------	2,669,359
1962	974,650	949,710	747,106	----------	2,671,466
1963	1,297,590	1,389,314	706,162	----------	3,393,066

[1] Sullivan County included in Wyoming region.

Dredges.—As the preponderant part of the river coal produced is "captive" tonnage (coal used by the producer), it is not nearly so responsive to fluctuations in the general market as are the small sizes produced from other sources. Thus, no significance can be attached to the decline of about 35,000 tons, or 5 percent, in production between 1962 and 1963, particularly since river-coal production has averaged approximately 700,000 tons per annum for the past decade. Tables 14 and 15 contain data on recovery of anthracite from rivers and their tributaries.

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TABLE 14.—Pennsylvania anthracite produced by dredges in 1963, by rivers

(Including tributaries)

River	Production (net tons)	Value	
		Total	Average
Schuylkill	83,768	$275,490	$3.29
Susquehanna	607,962	2,193,611	3.61
Total	691,730	2,469,101	3.57

TABLE 15.—Pennsylvania anthracite produced by dredges, by rivers

(Including tributaries)

	Lehigh River (net tons)	Schuylkill River (net tons)	Susquehanna River (net tons)	Total (net tons)	Total value	Average value (per ton)
1940	[1] 78,947	(1)	863,997	942,944	$1,097,000	$1.16
1941	47,838	396,522	1,073,203	1,517,563	1,839,784	1.21
1942	9,385	268,919	1,006,729	1,285,033	1,478,719	1.15
1943	37,452	342,815	954,470	1,334,737	1,972,777	1.48
1944	40,894	494,371	837,472	1,372,737	2,084,431	1.52
1945	41,409	366,161	797,656	1,205,226	1,924,148	1.60
1946	37,441	247,757	847,196	1,132,394	2,091,324	1.85
1947	46,478	158,102	1,015,128	1,219,706	2,480,068	2.03
1948	54,284	67,871	865,849	988,004	2,291,752	2.32
1949	22,131	52,012	790,979	865,122	2,131,096	2.46
1950	21,877	34,222	563,465	619,564	1,677,508	2.71
1951	25,344	27,454	508,770	561,568	1,576,576	2.81
1952	17,402	30,407	324,245	372,054	1,109,778	2.98
1953	31,391	20,643	386,147	438,181	1,449,149	3.31
1954	16,015	----------	709,892	725,907	1,810,026	2.49
1955	29,935	60,256	698,652	788,843	1,844,835	2.34
1956	44,262	5,540	666,485	716,287	1,273,415	1.78
1957	30,650	10,167	616,884	657,701	1,143,152	1.74
1958	30,763	10,230	650,800	691,793	1,324,943	1.92
1959	13,312	13,213	690,094	716,619	2,310,895	3.22
1960	22,700	23,624	665,839	712,163	2,257,367	3.17
1961	2,975	122,880	619,993	745,848	2,355,314	3.16
1962	----------	98,076	628,975	727,051	2,475,987	3.41
1963	----------	83,768	607,962	691,730	2,469,101	3.57

[1] Schuylkill included with Lehigh in 1940.

Weekly and Monthly Data.—The Bureau publishes a series of weekly reports containing estimates of weekly and monthly production of Pennsylvania anthracite, as well as a record of daily and weekly carloadings. Estimates of production are derived primarily from factors based on carloading data furnished by the Association of American Railroads. Secondary factors are those for colliery fuel, river coal, and truck shipments. The weekly and monthly estimates have been adjusted to the production total for 1963 and are presented in tables 16 and 17. The weekly anthracite report also contains supplementary monthly tables on rail and truck shipments, consumption, retail-dealer stocks and deliveries, imports, exports, and other related subjects. Requests to be placed on the mailing list for this publication should be addressed to the Bureau of Mines.

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TABLE 16.—Estimated weekly production of Pennsylvania anthracite in 1963[1]

Week ended—	Thousand net tons	Week ended—	Thousand net tons	Week ended—	Thousand net tons
Jan. 5[2]	214	May 18	359	Sept. 28	375
12	464	25	367	Oct. 5	392
19	441	June 1	283	12	407
26	385	8	314	19	419
Feb. 2	397	15	379	26	398
9	419	22	360	Nov. 2	373
16	395	29	395	9	400
23	394	July 6	160	16	439
Mar. 2	292	13	124	23	420
9	340	20	301	30	272
16	355	27	345	Dec. 7	411
23	353	Aug. 3	325	14	418
30	368	10	369	21	344
Apr. 6	244	17	376	28	229
13	280	24	390	31[2]	133
20	266	31	340		
27	273	Sept. 7	318	Total	18,267
May 4	331	14	406		
11	323	21	392		

[1] Estimated from weekly carloadings, as reported by Association of American Railroads, and other factors; adjusted to annual production from Bureau of Mines canvass.
[2] Figures represent output of working days in that part of week included in calendar year 1963. Revised total for week of January 5, 1963, was 262,000 net tons. Preliminary production for week of January 4, 1964, was 279,000 net tons.

TABLE 17.—Estimated monthly production of Pennsylvania anthracite, in thousand net tons[1]

Month	1956	1957	1958	1959	1960	1961	1962	1963
January	2,743	2,625	2,161	2,318	1,701	1,767	1,810	1,799
February	2,360	2,072	1,753	1,645	1,643	1,721	1,522	1,529
March	2,052	1,798	1,476	1,593	1,749	1,438	1,513	1,489
April	2,258	2,037	1,545	1,588	1,281	1,173	1,257	1,195
May	1,947	2,294	1,612	1,466	1,313	1,418	1,319	1,524
June	2,470	2,551	1,963	1,777	1,496	1,344	1,339	1,455
July	1,890	1,478	1,377	1,206	1,186	1,178	906	1,124
August	2,729	2,294	1,750	1,600	1,704	1,533	1,328	1,606
September	2,509	2,173	2,050	1,823	1,580	1,394	1,193	1,574
October	2,971	2,262	1,966	1,805	1,678	1,603	1,528	1,822
November	2,629	1,928	1,559	1,863	1,692	1,501	1,664	1,615
December	2,342	1,826	1,959	1,965	1,794	1,376	1,515	1,535
Total	28,900	25,338	21,171	20,649	18,817	17,446	16,894	18,267

[1] Production is estimated from weekly carloadings, as reported by the Association of American Railroads, and includes mine fuel, coal sold locally, and dredge coal.

Mechanical Loading.—Mechanical loading staged a sharp upturn in 1963 as the total (3.7 million net tons) represented an increase of about 600,000 tons, or 20 percent. Because total underground production changed little from 1962, the tonnage loaded by hand declined by approximately the same amount. As a result, hand loading, which reached 54 percent of total underground production in 1962, dropped to 45 percent, and mechanical loading moved up to a record 55 percent in 1963. The greater part (518,000 tons) of the increase occurred in the Northern field where the relatively flat-lying seams are more amenable to mechanization of some of the mining operations. Figure 5 shows trends in mechanical loading, hand loading, and stripping for 1940–63. Tables 18 and 19 present data on the tonnages loaded and the number and types of equipment used.

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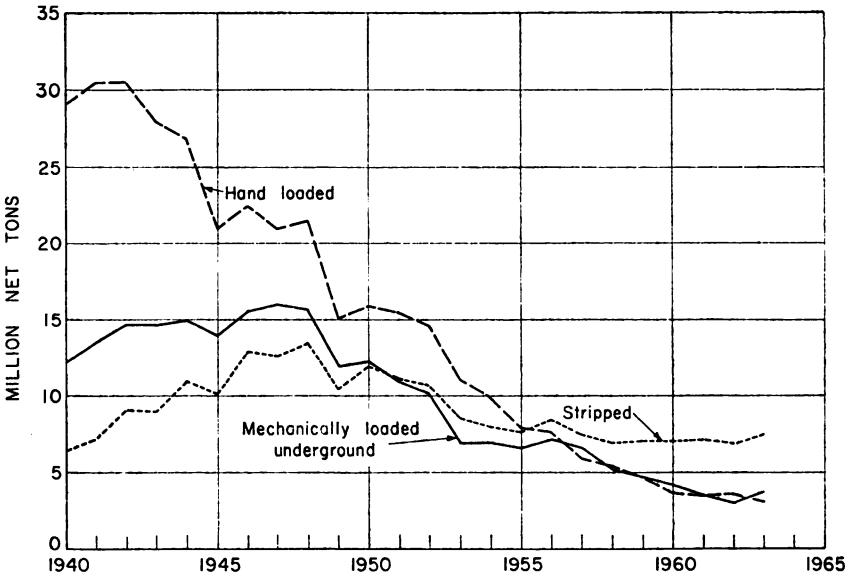

FIGURE 5.—Pennsylvania anthracite mechanically loaded, hand loaded, and stripped, 1940–63.

TABLE 18.—Pennsylvania anthracite loaded mechanically underground, by fields, in net tons

Field	Scraper loaders [1]		Pit-car loaders		Hand loaded face conveyors, all types [2]		Total mechanically loaded	
	1962	1963	1962	1963	1962	1963	1962	1963
Northern	678,681	1,013,878	-------	110,342	1,659,875	1,732,058	2,338,556	2,856,278
Eastern Middle	8,561	----------	1,335	1,047	66,156	48,863	76,052	49,910
Western Middle	64,647	51,716	----------	1,500	175,033	267,329	239,680	320,545
Southern	85,611	101,574	18,723	16,000	306,742	321,655	411,076	439,229
Total	837,500	1,167,168	20,058	128,889	2,207,806	2,369,905	3,065,364	3,665,962

[1] Includes mobile loaders.
[2] Shaker chutes, including those equipped with duckbills.

TABLE 19.—Pennsylvania anthracite loaded mechanically underground, in net tons

Year	Scraper loaders		Mobile loaders		Conveyors [1] and pit-car loaders		Total loaded mechanically	
	Number of units	Net tons loaded	Number of units	Net tons loaded	Number of units	Net tons loaded	Number of units	Net tons loaded
1959	186	771,142	46	602,631	869	3,236,769	1,101	4,700,542
1960	114	525,482	45	691,942	754	2,826,968	913	4,044,392
1961	132	595,572	27	387,417	616	2,394,789	775	3,377,778
1962	128	541,241	34	296,259	536	2,227,864	698	3,065,364
1963	147	862,252	30	304,916	512	2,498,794	689	3,665,962

[1] Includes duckbills and other self-loading conveyors.

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TABLE 20.—Trends in mechanical loading, hand loading, and stripping of Pennsylvania anthracite

(Mechanical loading includes coal handled on pit-car loaders and hand-loaded face conveyors)

Year	Fresh-mined coal							
	Underground					Strip pits		Total
	Mechanical loading (net tons)	Percent of total, underground	Hand loading (net tons)	Percent of total, underground	Total (net tons)	Net tons	Percent of total, fresh mined	
1927	[1] 2,223,281	3.0	71,434,537	97.0	73,657,818	2,153,156	2.8	75,810,974
1928	[1] 2,351,074	3.4	67,373,788	96.6	69,724,862	2,422,924	3.4	72,147,786
1929	3,470,158	5.0	66,493,690	95.0	69,963,848	1,911,766	2.7	71,875,614
1930	4,467,750	6.9	60,458,344	93.1	64,926,094	2,536,288	3.8	67,462,382
1931	4,384,780	8.2	49,074,722	91.8	53,459,502	3,813,237	6.7	57,272,739
1932	5,433,340	12.4	38,400,820	87.6	43,834,160	3,980,973	8.3	47,815,133
1933	6,557,267	16.0	34,474,844	84.0	41,032,111	4,932,069	10.7	45,964,180
1934	9,284,486	19.1	39,290,255	80.9	48,574,741	5,798,138	10.7	54,372,879
1935	9,279,057	21.2	34,503,819	78.8	43,782,876	5,187,072	10.6	48,969,948
1936	10,827,946	24.2	33,898,560	75.8	44,726,506	6,203,267	12.2	50,929,773
1937	10,683,837	25.1	31,882,514	74.9	42,566,351	5,696,018	11.8	48,262,369
1938	10,151,669	26.6	27,990,628	73.4	38,142,297	5,095,341	11.8	43,237,638
1939	11,773,833	27.7	30,797,715	72.3	42,571,548	5,486,479	11.4	48,058,027
1940	12,326,000	29.7	29,190,837	70.3	41,516,837	6,352,700	13.3	47,869,537
1941	13,441,987	30.6	30,435,277	69.4	43,877,264	7,316,574	14.3	51,193,838
1942	14,741,459	32.6	30,495,240	67.4	45,236,699	9,070,933	16.7	54,307,632
1943	14,745,793	34.5	27,990,005	65.5	42,735,798	8,989,387	17.4	51,725,185
1944	14,975,146	35.8	26,800,270	64.2	41,775,416	10,953,030	20.8	52,728,446
1945	13,927,955	39.9	20,957,744	60.1	34,885,699	10,056,325	22.4	44,942,024
1946	15,619,162	41.0	22,465,295	59.0	38,084,457	12,858,930	25.2	50,943,387
1947	16,054,011	43.4	20,909,101	56.6	36,963,112	12,603,545	25.4	49,566,657
1948	15,742,368	42.3	21,432,923	57.7	37,175,291	13,352,874	26.4	50,528,165
1949	11,858,088	43.9	15,172,562	56.1	27,030,650	10,376,808	27.7	37,407,458
1950	12,335,650	43.8	15,820,245	56.2	28,155,895	11,833,934	29.6	39,989,829
1951	10,847,787	41.2	15,494,452	58.8	26,342,239	11,135,990	29.7	37,478,229
1952	10,034,464	40.5	14,713,819	59.5	24,748,283	10,696,705	30.2	35,444,988
1953	6,838,769	38.2	11,054,720	61.8	17,893,489	8,606,482	32.5	26,499,971
1954	6,978,035	41.4	9,874,373	58.6	16,852,408	7,939,680	32.0	24,792,088
1955	6,660,939	45.9	7,837,819	54.1	14,498,758	7,703,907	34.7	22,202,665
1956	7,308,110	48.5	7,746,794	51.5	15,054,904	8,354,230	35.7	23,409,134
1957	6,657,479	52.8	5,958,574	47.2	12,616,053	7,543,157	37.4	20,159,210
1958	5,332,043	49.8	5,366,792	50.2	10,698,835	6,877,761	39.1	17,576,596
1959	4,700,542	49.9	4,714,928	50.1	9,415,470	7,096,343	43.0	16,511,813
1960	4,044,392	52.6	3,651,586	47.4	7,695,978	7,112,288	48.0	14,808,266
1961	3,377,778	49.8	3,406,808	50.2	6,784,586	7,246,646	51.6	14,031,232
1962	3,065,364	45.9	3,607,558	54.1	6,672,922	6,822,207	50.6	13,495,129
1963	3,665,962	54.6	3,048,784	45.4	6,714,746	7,467,842	52.7	14,182,588

[1] As reported by Commonwealth of Pennsylvania, Department of Mines.

Cutting Machines.—Only a minor part of the Pennsylvania anthracite produced underground is undercut before shooting because of the steeply-pitched seams. In 1963, the total was 240,000 tons, compared with 278,000 tons in 1962, with the same number of machines (5) being used in both years.

Power Equipment.—The number of power units reported used in strip mining and recovering coal from culm banks did not vary materially from 1962, despite the 9 percent gain in strip production and 27 percent in bank output. This development was undoubtedly attributable to increased working time. For example, in 1963, 118 power shovels and 205 draglines were reported used in strip mining—an increase of 4 shovels, but a decrease of 6 draglines. In bank operations, 26 shovels and 25 draglines were reported used—an increase of 3 shovels and 1 dragline. Two shovels and 16 draglines were used during the year for both stripping and culm-bank recovery. The number and types of power equipment used by the anthracite industry in 1961–63 are shown in table 21.

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TABLE 21.—Power shovels and draglines used in recovering coal from culm banks and in stripping Pennsylvania anthracite, by type of power

Type of power	1961			1962			1963		
	Number of power shovels	Number of draglines	Total	Number of power shovels	Number of draglines	Total	Number of power shovels	Number of draglines	Total
Gasoline	22	15	37	8	6	14	24	11	35
Electric	41	56	97	39	59	98	27	50	77
Diesel	103	158	261	91	177	268	94	182	276
Diesel-electric	2	2	4	5	6	11	1	3	4
Total	168	231	399	143	248	391	146	246	392

PRICES AND VALUE OF SALES

Based on total production, including colliery fuel and dredge coal, the average value of Pennsylvania anthracite was $8.40 per short ton in 1963, a gain of 6 percent over the average for 1962. The increase in average value, when coupled with an equivalent advance of 8 percent in production, resulted in raising total value of output for the year to $153,503,000, an increment of approximately 14 percent to the 1962 industry revenue. Although there were differences in the percent of change in the prices received for individual sizes, the fact that there were no fluctuations in the 4 size categories—chestnut and larger, pea, buckwheat Nos. 1, 2, and 3, and buckwheat No. 4 and smaller—either as to the percentage produced or to revenue received, would indicate that the price structure was relatively firm throughout the entire range of sizes. This would seem to bear out the belief that the strong overseas demand tended to support higher prices for the large sizes, while increased demand in the overseas trade and American markets for the smaller sizes kept prices of these sizes also well above 1962 levels.

For instance, on the basis of total shipments (excluding colliery fuel), the pea and larger sizes averaged $11.65 per net ton in 1963, a gain of $0.75 per ton. However, within this category the increases ranged from $0.52 per ton for pea coal to $0.90 for egg and stove. Lump and broken, only small amounts of which are produced on special order, brought $0.92 more than in 1962; chestnut, $0.75 more. As a group the buckwheat sizes averaged $6.25, or $0.32 more than in 1962. Two sizes showed market weaknesses, buckwheat No. 3 (barley) averaged $6.63 for a loss of $0.01, and buckwheat No. 5 at $4.37 reflected a drop of $0.03 per ton. These minor decreases, however, were more than balanced by a gain of $0.67 for buckwheats—No. 1 ($8.39 in 1962), $0.53 for No. 2 ($8.47 in 1962). $0.11 for No. 4 ($4.78), and $0.29 for other sizes ($2.83).

As is customary in the Pennsylvania anthracite industry, spring discount prices were announced in early April 1963. On egg, stove, and chestnut, the spring prices represented a cut of $1.75 per net ton; on pea, $0.50–$0.70; buckwheat No. 1 $0.25–$0.75; buckwheat No. 2 (rice), $0.25–$0.50; and buckwheat No. 3 (barley), $0.40–$0.50. In past years, spring prices were increased at stated intervals by

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amounts that would re-establish the winter price by the beginning of the heating season. However, the spring discount prices remained in effect only a few weeks in 1963 as a strong demand developed during the early summer months in both the United States and Europe as an aftermath of the extremely cold winter of 1962–63. This development, of course, also played an important role in raising the average revenue per ton of the industry.

The wholesale prices quoted in the December 21, 1963, issue of Saward's Journal also reflected the higher f.o.b. mine prices received for the 1963 output. According to this source, at the end of the year egg, stove, and chestnut sizes were being quoted at $14.50–$15.50 per net ton, or $0.75–$1.00 higher than on an equivalent date in 1962. Pea, quoted at $11.50–$12.50, was up $1.00 and buckwheat No. 1, at $10.50–$11.00, ranged from $0.50 to $1.25 higher. Prices quoted on buckwheat No. 2 (rice) were approximately the same as for No. 1—$10.50–$10.75, also up $0.50 to $1.25. Barley, reflecting the market weakness mentioned previously, was quoted at $8.25–$8.50, compared with $8.15–$8.75 in 1962.

Retail prices of selected fuels are shown for several large cities in the primary anthracite marketing area in table 22. Trends in shipments and value, by size groups, are shown in figure 6. Average values, f.o.b. preparation plants, are presented by regions in tables 24–26.

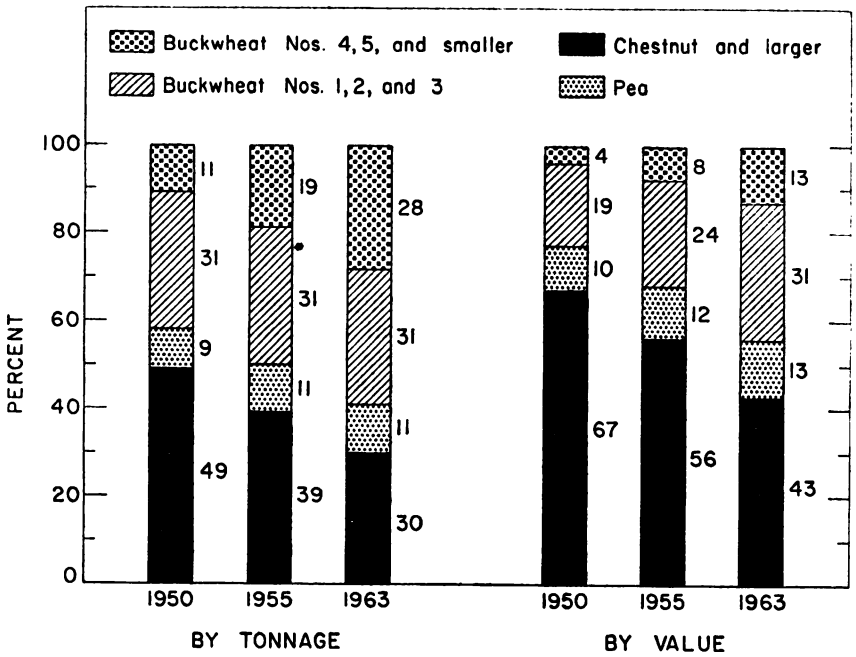

FIGURE 6.—Shipments of Pennsylvania anthracite, 1950, 1955, and 1963, by size groups, in percent of total tonnage and total value.

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TABLE 22.—Retail prices of selected fuels in 1963, by months, for various cities [1]

(Coal and coke per net ton; heating oil, per 100 gallons; gas, per 100 therms)

City and fuel	January	February	March	April	May	June	July	August	September	October	November	December
Baltimore, Md.:												
Anthracite:												
Stove	$22.08	$22.08	$22.08	$22.08	$21.89	$21.89	$22.23	$22.23	$23.62	$23.62	$23.62	$24.37
Buckwheat No. 1	19.83	19.83	19.83	19.83	19.57	19.57	19.91	19.91	20.88	20.88	20.88	21.26
Heating oil: Fuel oil No. 2	15.59	15.59	15.61	15.76	15.76	15.76	15.76	15.76	15.76	15.76	15.76	15.76
Boston, Mass.:												
Anthracite:												
Stove	31.25	31.25	31.25	31.25	30.48	30.48	31.50	31.50	31.50	32.75	33.50	33.50
Buckwheat No. 1	25.38	25.38	25.38	25.38	24.94	24.94	25.69	25.69	25.69	26.69	27.56	27.56
Heating oil: Fuel oil No. 2	15.95	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90
New York, N.Y.:												
Anthracite:												
Stove	28.35	28.35	28.35	28.35	27.60	28.35	28.35	28.83	29.17	29.17	30.09	30.09
Pea	23.85	23.85	23.85	23.85	23.22	24.15	24.15	24.46	24.99	24.99	25.89	25.89
Buckwheat No. 1	22.20	22.20	22.20	22.20	21.46	22.67	22.67	22.89	23.51	23.51	24.24	24.24
Heating oil: Fuel oil No. 2	16.11	16.05	16.05	16.07	15.87	15.79	15.79	15.79	15.79	15.88	16.23	16.23
Philadelphia, Pa.:												
Anthracite:												
Chestnut	25.58	25.58	25.58	25.58	24.82	24.20	24.20	24.45	26.20	26.20	26.20	26.20
Buckwheat No. 1	22.08	22.08	22.08	22.08	21.32	20.44	20.44	20.94	22.95	22.95	22.95	22.95
Heating oil: Fuel oil No. 2	15.70	15.70	15.70	15.70	15.70	15.07	15.07	15.07	15.07	15.07	15.38	15.70
Washington, D.C.:												
Anthracite:												
Chestnut	28.21	28.21	28.21	28.21	25.94	25.91	26.89	27.35	28.19	28.90	28.90	29.00
Buckwheat No. 1	21.66	21.66	21.66	21.66	20.73	20.93	21.35	21.53	21.73	21.73	21.73	21.84
Heating oil: Fuel oil No. 2	15.98	15.98	15.98	15.98	15.98	15.98	15.98	15.98	15.98	15.98	15.98	15.98
Gas, natural	13.27	13.31	12.92	12.82	12.70	12.43	13.12	12.93	12.80	13.49	13.13	13.45

[1] Compiled from reports of Bureau of Labor Statistics. Prices are as of the 15th of the month. Data are preliminary. Sales tax included where applicable.

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TABLE 23.—Standard anthracite specifications approved and adopted by the Anthracite Committee, effective July 28, 1947

Size	Round test mesh (inches)	Percent					
		Oversize, maximum	Undersize		Maximum impurities [1]		
			Maximum	Minimum	Slate	Bone	Ash [2]
Broken	Through 4⅜				1½	2	11
	Over 3¼ to 3		15	7½			
Egg	Through 3¼ to 3	5			1½	2	11
	Over 2⅛		15	7½			
Stove	Through 2⅛	7½			2	3	11
	Over 1⅝		15	7½			
Chestnut	Through 1⅝	7½			3	4	11
	Over 1¾		15	7½			
Pea	Through 1¾	10			4	5	12
	Over ⅝		15	7½			
Buckwheat No. 1	Through ⅝	10					13
	Over ⅜		15	7½			
Buckwheat No. 2 (rice)	Through ⅜	10					13
	Over ⅜		17	7½			
Buckwheat No. 3 (barley)	Through ⅜	10					15
	Over 3/32		20	10			
Buckwheat No. 4	Through 3/32	20					15
	Over 3/64		30	10			
Buckwheat No. 5	Through 3/64	30	No limit				16

[1] When slate content in sizes from broken to chestnut, inclusive, is less than above standards, bone content may be increased by 1½ times the decrease in slate content under the allowable limits, but slate content specified above shall not be exceeded in any event.

A tolerance of 1 percent is allowed on maximum percentage of undersize and maximum percentage of ash content.

Maximum percentage of undersize is applicable only to anthracite as it is produced at preparation plant.

Slate is defined as any material that has less than 40 percent fixed carbon.

Bone is defined as any material that has 40 percent or more, but less than 75 percent, fixed carbon.

[2] Ash determinations are on a dry basis.

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TABLE 24.—Average sales realization per net ton of Pennsylvania anthracite at preparation plants in 1963, by regions and sizes

(Excludes dredge coal)

Size	Lehigh region			Schuylkill region		
	Shipped by rail	Shipped by truck	Total	Shipped by rail	Shipped by truck	Total
Lump [1] and broken				$12.62	$12.63	$12.62
Egg	$11.77	$11.49	$11.75	11.83	11.30	11.81
Stove	12.20	12.51	12.28	12.10	11.78	11.92
Chestnut	12.23	12.49	12.39	12.01	11.77	11.86
Pea	9.46	10.02	9.89	9.64	9.62	9.63
Total pea and larger	11.74	11.42	11.57	11.44	11.16	11.28
Buckwheat No. 1	8.28	9.03	8.76	8.79	8.76	8.78
Buckwheat No. 2 (rice)	8.55	9.46	9.25	8.50	8.69	8.63
Buckwheat No. 3 (barley)	6.58	6.87	6.74	6.60	6.71	6.67
Buckwheat No. 4	4.92	5.13	4.97	4.72	4.67	4.70
Buckwheat No. 5	4.89	4.64	4.86	4.29	3.60	4.12
Other [2]	3.13	2.88	3.00	3.30	3.19	3.25
Total buckwheat No. 1 and smaller	5.31	6.61	5.89	5.75	6.57	6.16
Total all sizes	7.24	8.43	7.81	7.71	8.48	8.12

Size	Wyoming region [3]			Total		
Lump [1] and broken	$11.72	$11.73	$11.72	$11.84	$12.54	$12.10
Egg	12.19	12.18	12.19	12.05	11.69	12.03
Stove	12.39	12.49	12.42	12.27	12.05	12.19
Chestnut	12.56	12.70	12.62	12.30	12.19	12.24
Pea	10.59	10.96	10.83	9.99	10.24	10.15
Total pea and larger	12.15	11.91	12.06	11.84	11.45	11.65
Buckwheat No. 1	9.15	9.80	9.51	8.87	9.21	9.06
Buckwheat No. 2 (rice)	9.20	9.54	9.41	8.77	9.11	9.00
Buckwheat No. 3 (barley)	6.46	6.64	6.53	6.53	6.73	6.64
Buckwheat No. 4	5.72	5.05	5.60	4.97	4.79	4.90
Buckwheat No. 5	4.74	4.84	4.77	4.56	3.99	4.44
Other [2]		1.92	1.92	3.24	2.73	2.94
Total buckwheat No. 1 and smaller	7.42	7.50	7.46	6.04	6.83	6.43
Total all sizes	10.24	9.58	9.94	8.50	8.80	8.64

[1] Quantity of lump included is insignificant.
[2] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low dollar value.
[3] Includes Sullivan County.

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TABLE 25.—Average sales realization per net ton of Pennsylvania anthracite at preparation plants, by region and sizes

(Excludes dredge coal)

Size	Lehigh region					Schuylkill region				
	1959	1960	1961	1962	1963	1959	1960	1961	1962	1963
Lump [1] and broken	$12.88		$11.29			$12.24	$10.62	$10.96	$11.34	$12.62
Egg	12.06	$10.23	10.79	$11.02	$11.75	11.26	10.23	10.39	11.01	11.81
Stove	11.89	10.59	11.14	11.46	12.28	11.06	10.39	10.69	10.93	11.92
Chestnut	12.11	10.98	11.52	11.77	12.39	11.11	10.56	10.80	10.97	11.86
Pea	10.07	9.44	9.22	9.36	9.89	9.14	8.59	8.66	8.80	9.63
Total pea and larger	11.44	10.41	10.75	10.92	11.57	10.59	9.97	10.19	10.36	11.28
Buckwheat No. 1	9.22	8.75	8.24	8.03	8.76	8.60	8.14	7.99	8.09	8.78
Buckwheat No. 2 (rice)	9.56	9.29	8.99	8.80	9.25	8.39	7.99	7.94	7.99	8.63
Buckwheat No. 3 (barley)	7.55	7.25	6.89	6.68	6.74	6.84	6.76	6.62	6.54	6.67
Buckwheat No. 4	5.11	5.05	4.88	4.94	4.97	4.80	4.88	4.76	4.58	4.70
Buckwheat No. 5	4.96	4.89	4.70	4.94	4.86	4.37	4.23	4.21	4.16	4.12
Other [2]	2.31	1.77	1.86	2.02	3.00	2.75	2.90	2.99	3.45	3.25
Total buckwheat No. 1 and smaller	6.27	5.82	6.10	5.45	5.89	6.14	6.00	5.82	5.95	6.16
Total all sizes	8.28	7.60	7.98	7.48	7.81	7.85	7.50	7.51	7.68	8.12

Size	Wyoming region [3]					Total				
	1959	1960	1961	1962	1963	1959	1960	1961	1962	1963
Lump [1] and broken	$11.84	$11.20	$11.50	$11.06	$11.72	$12.25	$10.87	$11.29	$11.18	$12.10
Egg	11.22	10.42	11.08	11.21	12.19	11.44	10.31	10.84	11.13	12.03
Stove	11.32	10.74	11.57	11.59	12.42	11.29	10.56	11.10	11.29	12.19
Chestnut	11.75	11.23	11.96	11.98	12.62	11.53	10.89	11.36	11.49	12.24
Pea	10.85	10.64	10.87	10.60	10.83	10.03	9.57	9.65	9.63	10.15
Total pea and larger	11.36	10.90	11.51	11.42	12.06	11.04	10.42	10.80	10.90	11.65
Buckwheat No. 1	9.48	8.92	9.34	8.86	9.51	9.04	8.54	8.55	8.39	9.06
Buckwheat No. 2 (rice)	9.27	9.09	9.24	8.95	9.41	8.90	8.56	8.55	8.47	9.00
Buckwheat No. 3 (barley)	7.15	7.16	7.15	6.77	6.53	7.04	6.95	6.83	6.64	6.64
Buckwheat No. 4	5.20	5.19	5.15	5.30	5.60	4.95	4.95	4.85	4.78	4.90
Buckwheat No. 5	4.70	4.78	4.90	4.61	4.77	4.54	4.43	4.43	4.41	4.44
Other [2]	3.53	2.54	2.18	2.22	1.92	2.80	2.52	2.64	2.62	2.94
Total buckwheat No. 1 and smaller	7.69	7.00	7.41	6.94	7.46	6.60	6.27	6.32	6.14	6.43
Total all sizes	9.65	8.92	9.54	9.26	9.94	8.55	8.01	8.26	8.19	8.64

[1] Quantity of lump included is insignificant.
[2] Includes various mixtures of buckwheat Nos. 2 to 5 and coal of relatively low dollar value.
[3] Includes Sullivan County.

TABLE 26.—Average value per net ton of Pennsylvania anthracite from all sources, by regions [1]

Region	1962				1963			
	Shipped by rail	Shipped by truck	Colliery fuel	Total	Shipped by rail	Shipped by truck	Colliery fuel	Total
Lehigh	$7.90	$7.17	$4.36	$7.47	$7.24	$8.43	$5.57	$7.80
Schuylkill	6.92	7.61	4.58	7.29	7.18	8.33	7.58	7.76
Wyoming [2]	9.58	8.91	2.76	9.12	10.24	9.58	2.52	9.77
Total	8.06	7.91	3.10	7.94	8.20	8.72	3.05	8.40

[1] Value given for shipments is that at which coal left possession of producing company and does not include selling expenses.
[2] Includes Sullivan County.

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EMPLOYMENT

Reports submitted to the Bureau on mine injuries and employment indicated that the long downward trend in employment in the Pennsylvania anthracite industry continued in 1963 despite an 8-percent increase in production. Based on these reports, the average number of men working daily was 13,498, 4 percent less than in 1962.

Of the total number of men working daily in 1963, 40 percent were employed at underground mines; 14 percent, in surface work at underground operations (including general shops); 23 percent, at strip pits; 18 percent, at preparation plants; 4 percent, at culm banks; and 1 percent, on dredges. Notwithstanding the small increase (42,000 tons) in underground production, the average number of men working at deep mines (underground and surface) dropped from 7,870 in 1962 to 7,325 in 1963, a decline of 545 men, slightly more than the loss for the entire industry. Apparently this was achieved by a continuation of industry efforts to concentrate deep mining activities at the most efficient sites and by increased working time. Processing the enlarged output of both strip and culm-bank material resulted in a modest increase in employment at preparation plants. Employment at strip pits also registered a small net gain over that of 1962, but the number of men employed at banks was exactly the same.

Because of the relatively sharp increases in strip- and bank-coal production, compared with deep mined coal, employment varied materially between 1962 and 1963 on regional and county bases. In the Wyoming region, the average number of men working daily fell 8 percent below the 1962 figure; in the Schuylkill region, 4 percent. However, in the Lehigh region employment was up 10 percent. As a result, the Wyoming region share of the total labor force declined from 37 percent in 1962 to 35 percent in 1963, and the Lehigh share increased from 13 to 15 percent. The Schuylkill remained the same at 50 percent. The four major producing counties, Schuylkill, Luzerne, Northumberland, and Lackawanna again provided work for 93 percent of the total labor force; nonetheless, employment was down 17 percent in Lackawanna County and 5 percent in Schuylkill. In Northumberland County, however, employment showed a gain of 2 percent; it remained at the 1962 level in Luzerne County.

The Pennsylvania anthracite mining industry averaged 216 active working days in 1963, an increase of 12 days over those of 1962. The labor force in the Wyoming region enjoyed the greatest increase in working time, recording 231 days—17 days more than in 1962. In the Schuylkill, the number of days worked rose from 197 in 1962 to 209; in the Lehigh, from 200 to 205. Consequently, despite the decline in total employment, the number of man-days worked totaled 2,912,000—an increase of 2 percent. The productivity rate again set a record, reaching 6.27 tons per man-day, largely because of the increased production from strip pits and culm banks. Details on the number of men employed, days worked, man-days of labor, and productivity rates are presented in table 27. The labor force is broken down by counties in table 28.

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TABLE 27.—Men employed, days worked, man-days of labor and output per man per day at operations producing Pennsylvania anthracite in 1963

(Includes operations of strip contractors)

	Lehigh region	Schuylkill region	Wyoming region [1]	Total	
				1963	1962
Average number of men working daily:					
Underground	103	3,035	2,311	5,449	5,779
In strip pits	1,144	1,152	729	3,025	3,008
At culm banks	196	230	137	563	563
At preparation plants	507	1,290	676	2,473	2,443
Other surface	88	934	854	1,876	2,091
Total excluding dredge operations	2,038	6,641	4,707	13,386	13,884
Dredge operations		112		112	126
Total	2,038	6,753	4,707	13,498	14,010
Average number of days active:					
All operations except dredges	205	208	231	216	203
Dredge operations		231		231	227
Average, all operations	205	209	231	216	204
Man days of labor:					
All operations except dredges	418,145	1,382,759	1,085,050	2,885,954	2,824,240
Dredge operations		25,835		25,835	28,613
Total, all operations	418,145	1,408,594	1,085,050	2,911,789	2,852,853
Average tons per man-day:					
All operations except dredges	8.76	5.87	5.34	6.09	5.72
Dredge operations		26.77		26.77	25.41
Average all operations	8.76	6.26	5.34	6.27	5.92

[1] Includes Sullivan County.

TABLE 28.—Men employed at operations producing Pennsylvania anthracite, by counties

(Includes operations of strip contractors)

County	1962	1963	County	1962	1963
Berks, Lancaster, Lebanon, and Snyder	101	99	Northumberland	1,870	1,912
Carbon	306	343	Schuylkill	5,142	4,873
Columbia	389	307	Sullivan	19	11
Dauphin	186	181	Susquehanna and Wayne [1]	7	2
Lackawanna	1,312	1,086	Total	14,010	13,498
Luzerne	4,678	4,684			

[1] None employed in Susquehanna in 1963.

DISTRIBUTION

Reports submitted voluntarily to the Bureau of Mines by producers, wholesalers, and exporting firms, showed that 15,244,000 net tons of Pennsylvania anthracite was shipped during the 1962–63 coal year (April 1–March 31). Where possible, high-ash coal of low-dollar value, used largely as colliery fuel or for generation of electricity, was eliminated from the statistics. Of the total shipped to market during the year, about 84 percent was destined to points in the United States, 5 percent to Canada, and the remainder to overseas countries. When compared with 1961–62 coal-year movements, total shipments were down about 4 percent, with declines of 10 percent in the United States and 6 percent in exports to Canada. However, exports abroad more

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than doubled—rising from 803,000 tons in the 1961–62 coal year to 1,666,000 tons—as the result of continued shipments to U.S. Armed Forces in West Germany and the sharply increased demand in Western Europe—occasioned by the extremely cold winter of 1962–63.

By size, shipments of pea and larger declined less than 1 percent, but buckwheat No. 1 and smaller sizes, as a group, fell approximately 7 percent. Both in the United States and Canada, the demand for pea and larger sizes was about 9 percent below 1961–62 coal-year levels, but these losses were almost balanced by the increase of 90 percent in overseas exports of these sizes. The distribution pattern for the smaller sizes differed markedly, however, as shipments of buckwheat No. 1 and smaller registered a gain of 1 percent in Canada and 160 percent in overseas markets, while dropping 11 percent in the United States. Despite the sharp gain in exports of the smaller sizes, of greater import to the producing industry was the fact that 69 percent of European imports consisted of the higher-priced large sizes. Data are not presented in table 29 on individual countries to avoid disclosure of confidential company information; however, West Germany led all European countries with more than one-half million tons (including coal shipped to U.S. Armed Forces), followed in descending order by the Netherlands, France, Italy, Belgium-Luxembourg, and Spain.

Because of a gain of 2 percent in rail traffic (due entirely to increased exports) and an absolute decline of 10 percent in reported truck shipments, rail shipments accounted for 53 percent of the coal-year total, compared with 49 percent in the 1961–62 year. Truck shipments, therefore, fell from the record 51 percent set in the prior coal year, to 47 percent in 1962–63.

The effect of increased exports overseas on the transportation pattern was also reflected in the data for calendar year 1963, according to releases of the Pennsylvania Department of Mines and Mineral Industries. As indicated in table 30, the total tonnage moving by rail was 5 percent greater than in 1962 entirely because of the overseas trade, since declines of 9 and 15 percent occurred in rail shipments to Canada and the United States, respectively. The heavy movement overseas and the difficulty experienced by some shippers in assembling cargoes at the piers—particularly when vessels were scheduled to load only one or two sizes—resulted, according to trade reports, in the tie-up of large numbers of hopper cars at the docks. This situation, in turn, frequently created car shortages at the mines, and some producers experienced difficulty in meeting requirements of retail dealers, normally accustomed to obtaining a large part of their supplies by rail. Many of these dealers, apparently, either increased their truck purchases or dispatched trucks to the mines to obtain sufficient coal to satisfy immediate needs of their customers. As a result, total shipments by truck remained relatively unchanged from 1962, with gains in Pennsylvania markets "outside" the producing region, New York, and "Other States" virtually offsetting decreases in the producing region ("local sales")—New Jersey, Delaware, Maryland, and the District of Columbia. Maryland and the "Other States" category were the only U.S. markets showing a substantial increase in rail receipts. The movement of anthracite by truck in 1963 is shown by months and by States of destination in table 31, and for a 5-year period in table 32.

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TABLE 29.—Distribution of Pennsylvania anthracite, April 1, 1962 to March 31, 1963, by States, Provinces, and countries of destination, in net tons

Destination	Pea and larger						Buckwheat No. 1 and smaller					Total all sizes	Percent of total
	Broken	Egg	Stove	Chestnut	Pea	Total	Buckwheat No. 1	Buckwheat No. 2 (rice)	Buckwheat No. 3 (barley)	Other	Total		
United States:													
New England States:													
Connecticut	----------	887	27,125	30,724	1,720	60,456	4,090	6,787	7,828	56	18,761	79,217	0.5
Maine	----------	1,096	26,772	22,631	504	51,003	4,133	9,592	102	565	14,392	65,395	.4
Massachusetts	----------	12,440	133,855	67,883	8,942	223,120	32,181	32,067	10,067	11	74,326	297,446	2.0
New Hampshire	----------	497	16,356	10,602	737	28,192	2,938	7,209	----------	408	10,555	38,747	.3
Rhode Island	----------	483	8,200	6,323	237	15,243	4,315	867	----------	----------	5,182	20,425	.1
Vermont	----------	577	25,534	16,036	2,773	44,920	11,035	17,425	----------	----------	28,460	73,380	.5
Total	----------	15,980	237,842	154,199	14,913	422,934	58,692	73,947	17,997	1,040	151,676	574,610	3.8
Middle Atlantic States:													
New Jersey	612	11,464	159,199	347,435	117,959	636,669	234,331	150,659	281,730	249,292	916,012	1,552,681	10.2
New York	----------	22,760	485,580	397,289	510,173	1,415,802	389,189	222,694	226,900	283,550	1,122,333	2,538,135	16.7
Pennsylvania [1]	847	33,116	557,957	1,193,945	948,674	2,734,539	1,034,347	915,249	1,150,766	1,289,852	4,390,214	7,124,753	46.7
Total	1,459	67,340	1,202,736	1,938,669	1,576,806	4,787,010	1,657,867	1,288,602	1,659,396	1,822,694	6,428,559	11,215,569	73.6
South Atlantic States: [2]													
Delaware	----------	3,523	11,527	33,436	939	49,425	3,435	481	4,086	2,890	10,892	60,317	.4
District of Columbia	----------	601	8,747	7,492	1,016	17,856	4,768	675	480	3	5,926	23,782	.2
Maryland	174	818	50,487	41,196	3,501	96,176	22,755	3,229	797	183,789	210,570	306,746	2.0
Virginia	----------	242	7,178	4,857	291	12,568	1,649	342	62	2,638	4,691	17,259	.1
Total	174	5,184	77,939	86,981	5,747	176,025	32,607	4,727	5,425	189,320	232,079	408,104	2.7
Lake States: [2]													
Illinois	----------	----------	2,835	5,076	188	8,099	34,501	10,559	2,098	25,978	73,136	81,235	.5
Michigan	----------	14	4,807	3,249	297	8,367	173	4,825	9	50,960	55,967	64,334	.4
Minnesota	----------	----------	336	1,113	161	1,610	8	1	9	5,246	5,264	6,874	(4)
Ohio	----------	122	310	1,605	3,548	5,585	27,360	4,375	20,358	77,571	129,664	135,249	.9
Wisconsin	----------	----------	13,864	17,124	1,220	32,208	1,050	1,770	6	18,472	21,298	53,506	.4
Total	----------	136	22,152	28,167	5,414	55,869	63,092	21,530	22,480	178,227	285,329	341,198	2.2

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Other States		1,606	1,615	7,289	13,109	23,619	41,052	7,174	12,000	164,511	224,737	248,356	1.6
Total United States	1,633	90,246	1,542,284	2,215,305	1,615,989	5,465,457	1,853,310	1,395,980	1,717,298	2,355,792	7,322,380	12,787,837	83.9
Canada:													
Ontario		2,862	227,249	178,952	38,245	447,308	50,825	25,186	4,189	9,310	89,510	536,818	3.5
Quebec		1,021	50,840	27,182	1,275	80,318	35,846	17,091	89,615	21,787	164,339	244,657	1.6
Other Provinces		535	4,156	3,736	2	8,429	56	834	4	24	918	9,347	.1
Total Canada		4,418	282,245	209,870	39,522	536,055	86,727	43,111	93,808	31,121	254,767	790,822	5.2
Other countries	133	331,069	356,449	215,361	239,265	1,142,277	130,751	29,810	6,976	355,853	523,390	1,665,667	10.9
Grand total	1,766	425,733	2,180,978	2,640,536	1,894,776	7,143,789	2,070,788	1,468,901	1,818,082	2,742,766	8,100,537	15,244,326	100.0

[1] Includes "Local Sales."
[2] Shipments to other States in the South Atlantic area are included in "Other States".
[3] Shipments to Indiana are included in "Other States".
[4] Less than 0.05 percent.

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TABLE 30.—Rail shipments of Pennsylvania anthracite, by destinations, in net tons[1]

Destination	1959	1960	1961	1962	1963
New England States	932, 593	712. 780	602. 262	465, 535	407. 194
New York	2, 728, 926	2, 458, 043	2, 267, 861	1, 939, 004	1, 515, 786
New Jersey	1, 178, 965	988. 852	826, 323	858, 587	675, 159
Pennsylvania	2, 449, 545	2, 236, 964	2, 275, 481	2, 309, 182	2, 001, 932
Delaware	57, 597	48, 586	42. 194	21. 373	16, 630
Maryland	185, 073	167, 355	255, 658	182, 222	207, 904
District of Columbia	43, 664	22, 024	19, 561	15. 983	14, 982
Virginia	19, 262	17. 524	14. 158	18. 876	10. 613
Ohio	260. 278	165, 903	174, 620	165. 211	138, 546
Indiana	53. 785	44. 763	46, 650	29, 754	26, 306
Illinois	99. 826	91, 640	76, 348	75, 435	77, 548
Wisconsin	72. 346	60, 737	59. 815	41. 322	24. 562
Minnesota	10. 740	13, 032	8. 636	6, 304	8, 394
Michigan	28. 815	50, 835	55, 218	43. 028	35, 377
Other States	160, 260	154, 586	121, 119	190. 028	217, 351
Total United States	8, 281, 675	7, 233. 624	6, 845. 904	6, 361. 844	5, 378. 284
Canada	1, 311. 841	1, 067, 181	890. 058	713, 336	647, 437
Other foreign countries	187, 883	68, 875	82, 636	516, 376	1, 953, 671
Grand total	9, 781, 399	8, 369, 680	7, 818, 598	7, 591, 556	7, 979, 392

[1] Compiled from reports of Pennsylvania Department of Mines and Mineral Industries; does not include dredge coal.

TABLE 31.—Truck shipments of Pennsylvania anthracite in 1963, by months, and by States of destination, in net tons[1]

Destination	January	February	March	April	May	June	July
Pennsylvania:							
Within region	422, 609	380, 873	295, 134	255, 257	223, 658	181, 745	164, 034
Outside region	381, 557	345, 492	272, 710	173, 000	241, 619	242, 316	180, 593
New York	106, 690	95, 043	97, 030	43, 376	61, 465	68, 719	44, 525
New Jersey	67, 817	59, 174	47, 840	31, 772	42, 226	47, 705	30, 583
Delaware	6, 104	5, 229	3, 484	1, 469	1, 375	2, 907	2, 042
Maryland	17, 145	13, 982	8, 266	1, 749	2, 796	3, 446	4, 695
District of Columbia	942	1, 025	510	106	72	175	150
Other States	3, 787	3, 575	2, 849	1, 373	1, 345	1, 743	2, 265
Total:							
1963	1, 006, 651	904, 393	727, 823	508, 102	574, 556	548, 756	428, 887
1962	971, 776	868, 040	744, 621	558, 240	484, 211	513, 604	446, 939

Destination	August	September	October	November	December	Total	Percent of total trucked
Pennsylvania:							
Within region	207, 035	215, 274	250, 708	273, 063	358, 448	3, 227, 838	40. 5
Outside region	212, 159	268, 458	285, 436	263, 849	288, 686	3, 155, 875	39. 6
New York	59, 740	71, 673	77, 824	66, 064	78, 037	870, 186	10. 9
New Jersey	38, 765	43, 797	47, 706	40, 618	49, 330	547, 333	6. 9
Delaware	1, 963	2, 600	2, 373	3, 279	4, 640	37, 465	.5
Maryland	5, 007	7, 772	7, 879	8, 108	9, 150	89, 995	1. 1
District of Columbia	160	114	149	379	661	4, 443	.1
Other States	2, 783	3, 422	4, 295	4, 117	5, 417	36, 971	.4
Total:							
1963	527, 612	613, 110	676, 370	659, 477	794, 369	7, 970, 106	100. 0
1962	538, 710	558, 908	674, 352	785, 372	853, 423	7, 998, 196	100. 0

[1] Compiled from reports of Pennsylvania Department of Mines and Mineral Industries; does not include dredge coal.

The tonnage of anthracite moving over Lake Erie docks again dropped slightly—totaling 192,000 net tons, compared with 196,000 tons in 1962. Receipts were about 9,000 tons higher at Duluth-Superior. At Upper-Lake docks, receipts were 4,000 tons higher on

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Lake Michigan, but declined about 8,000 tons at Lake Superior. The ex-dock movement to inland points was also less on both Lakes Superior and Michigan. Detailed data on the Lake-dock trade in Pennsylvania anthracite are shown in table 2.

TABLE 32.—Truck shipments of Pennsylvania anthracite, by destinations, in net tons[1]

Destination	1959	1960	1961	1962	1963
Pennsylvania:					
Within region	3,904,608	3,826,445	3,744,781	3,471,725	3,227,838
Outside region	2,704,972	2,900,414	2,891,607	2,915,220	3,155,875
New York	1,279,693	1,217,342	1,194,765	844,447	870,186
New Jersey	619,926	548,678	641,329	591,905	547,333
Delaware	44,748	48,221	45,310	43,863	37,465
Maryland	98,118	103,381	92,837	92,249	89,995
District of Columbia	6,639	6,232	5,753	6,573	4,443
Other States	13,669	17,703	26,169	32,214	36,971
Total	8,672,373	8,668,416	8,642,551	7,998,196	7,970,106

[1] Compiled from reports of Pennsylvania Department of Mines and Mineral Industries; does not include dredge coal.

CONSUMPTION

Apparent consumption of Pennsylvania anthracite in the United States in 1963, calculated as production minus exports (including coal shipped to West Germany for the use of U.S. Armed Forces), totaled 14.2 million net tons—a decline of less than 1 percent from 1962. Although definitive data are lacking for many consumer categories, the relative stability of the market in the United States in 1963 was undoubtedly attributable to increased demand for the smaller industrial sizes since the output of fine coal (buckwheat No. 1 and smaller) exceeded that of 1962 by 9 percent. Although production of pea and larger increased by 7 percent over that of 1962, there was little doubt but that the increase was caused entirely by the stepped-up demand for large space-heating sizes in Europe. (See Foreign Trade section.) That substantial quantities of the large sizes moved to overseas market was further substantiated by the fact that exports to Canada (a traditional market for the space-heating sizes) were down about 11 percent and deliveries by United States retail dealers outside the producing region were approximately 15 percent below the 1962 volume.

Consumption of Pennsylvania anthracite continued to decline at public-utility plants, as the total for 1963 (2,155,000 tons) represented a decrease of 6 percent. In the iron and steel industry consumption moved up sharply, gaining 19 percent over that of 1962. Contributing to this increase was a gain of nearly 200,000 tons in the quantity used for sintering iron ore fines and pelletizing concentrates, an increase of about 30,000 tons for coke making, and approximately 60,000 tons for miscellaneous purposes. Consumption at cement plants remained virtually unchanged, but the amount used as colliery fuel showed a small increase as one large producer continued to burn culm-bank material to generate electricity.

Consumption of Pennsylvania anthracite by public-utility and coke plants is shown, by months, in table 2. Apparent consumption of an-

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thracite, briquets, coke, heating and range oil, and natural gas is shown in table 33 for the individual States comprising the primary anthracite-marketing area. Historical data on retail-dealer deliveries and consumption for certain industrial purposes are presented in table 34.

TABLE 33.—Apparent consumption of anthracite and selected competitive fuels in the principal anthracite markets

(Thousand net tons)

Fuel	New England	New York	New Jersey	Pennsylvania	Delaware	Maryland	District of Columbia	Total	Percent of total fuels
Anthracite (all users): [1]									
1960	713	[2] 3,675	[2] 1,537	8,964	97	271	28	15,285	11.2
1961	602	[2] 3,463	[2] 1,468	8,912	88	348	25	14,906	10.5
1962	466	[2] 2,783	[2] 1,451	8,696	65	274	23	13,758	9.3
1963	407	[2] 2,386	[2] 1,223	8,386	54	298	19	12,773	8.5
Imported: [3]									
1960	([4])	([4])						([4])	([5])
1961	([4])	([4])						([4])	([5])
1962	([4])			([4])				([4])	([5])
1963	([6])	([6])	([6])	([6])	([6])	([6])	([6])	([6])	([6])
Briquets (domestic use):									
1960	1			([4])		1		2	([5])
1961	1			([4])		1		2	([5])
1962	([4])	1	1	([4])		1	([4])	3	([5])
1963	1	2	2	([4])		1	([4])	6	([5])
Coke (domestic use):									
1960	128	30	98	29	([4])			285	.2
1961	108	26	81	23	([4])			238	.2
1962	76	19	70	18				183	.1
1963	59	13	60	18				150	.1
Imported: [3]									
1960	([4])	1						1	([5])
1961	([4])	2						2	([5])
1962	([4])	3						3	([5])
1963	([4])	22				([4])		22	([5])
Oil (heating and range): [7]									
1960	31,008	27,714	11,201	11,510	991	4,135	1,200	87,759	64.0
1961	32,087	30,285	11,581	11,018	873	4,224	1,015	91,083	63.9
1962	32,891	32,294	12,076	12,433	1,003	4,442	1,092	96,231	64.7
1963	31,783	32,154	12,829	12,519	1,148	4,506	1,167	96,106	64.4
Natural gas: [8]									
1960	3,516	11,890	3,532	11,913	181	[9] 2,738	([9])	33,770	24.6
1961	3,927	12,834	4,155	12,240	206	[9] 2,887	([9])	36,249	25.4
1962	4,298	13,590	4,551	12,685	228	[9] 3,086	([9])	38,438	25.9
1963	4,611	14,290	4,897	12,992	249	[9] 3,218	([9])	40,257	27.0
Total:									
1960	35,366	43,310	16,368	32,416	1,269	[10] 7,145	[10] 1,228	137,102	100.0
1961	36,725	46,610	17,285	32,193	1,167	[10] 7,460	[10] 1,040	142,480	100.0
1962	37,731	48,690	18,149	33,832	1,296	[10] 7,803	[10] 1,115	148,616	100.0
1963	36,861	48,867	19,011	33,915	1,451	[10] 8,023	[10] 1,186	149,314	100.0

[1] Pennsylvania Department of Mines and Mineral Industries.
[2] Part of anthracite shown as shipped to New Jersey is reshipped to New York City.
[3] U.S. Department of Commerce.
[4] Less than 500 tons.
[5] Less than 0.05 percent.
[6] This series discontinued with August.
[7] Converted to coal equivalent upon the basis of 4 barrels of fuel oil equaling 1 ton of coal.
[8] Converted to coal equivalent upon the basis of 24,190 cubic feet of natural gas equaling 1 ton of coal.
[9] District of Columbia included with Maryland.
[10] Natural gas for the District of Columbia included with Maryland.

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TABLE 34.—Retail dealer deliveries and consumption of Pennsylvania anthracite in the United States, 1955–63, by selected consumer categories

(Thousand net tons)

Year	Retail dealer deliveries [1]	Colliery fuel	Railroads [2]	Electric utilities [3]	Briquet plants	Cement plants	Iron and steel industry		
							Coke making	Sintering and pelletizing [4]	Other
1955	13,019	419	457	3,209	264	199	366	385	443
1956	13,018	342	409	3,296	228	244	377	564	625
1957	10,670	279	361	3,363	156	221	389	868	698
1958	9,386	195	335	2,786	120	183	255	685	686
1959	7,562	129	292	2,629	43	159	369	780	683
1960	6,775	102	248	2,751	31	152	370	754	720
1961	5,070	45	(6)	2,509	28	153	320	588	685
1962	4,767	152	(6)	2,297	(7)	188	420	560	609
1963	4,055	161	(6)	2,155	(7)	184	451	766	670

[1] Estimated from reports submitted by a selected list of retail dealers. Does not include local sales.
[2] Association of American Railroads.
[3] Federal Power Commission.
[4] Annual Statistical Report, American Iron and Steel Institute.
[5] Annual Statistical Report, American Iron and Steel Institute. Contains a small but not exactly determined amount of anthracite used for sintering.
[6] Not available.
[7] Concealed to avoid disclosure of individual company data.

STOCKS

Data on producer stocks were discontinued with October 1962, at which time only 124,000 tons were in ground storage at the mines. For many decades, the anthracite industry traditionally stored millions of tons of prepared coal in the producing region to satisfy a demand that normally far exceeded production during the winter months. However, with the long-term decline for its product and increased costs of storing coal, the industry has so reduced its mine-storage capacity that today it apparently lacks the flexibility to meet sudden, unexpected demand for large tonnages—particularly of a single size, or a narrow range of sizes.

This condition was brought into sharp focus late in 1963 when numerous spot shortages were reported at the retail level in the New England and Middle Atlantic States. The belief was expressed in some quarters that these reported shortages were caused by the heavy movement of space-heating sizes overseas and the lack of stored coal at the mines. However, this was not entirely true. As indicated in table 2, most retail dealers, either in anticipation of increased exports or fear of a recurrence of the severe winter of 1962–63, closely followed their stocking pattern of 1962. For example, according to Bureau estimates, stocks in retail yards were less than 50,000 tons below those of 1962 for the June–September period and were slightly higher for the last quarter. Thus, it would appear that the isolated cases of reported shortages were caused either by a slight maldistribution of stocks among retailers or by the inability of some producers to ship certain sizes from current production, or from storage, at the time requested by the retail dealer.

Public utilities continued to decrease consumption of anthracite and to draw upon stocks. At the close of the year, public utilities reported stocks of 1,294,000 tons, a decrease of about 10 percent from the 1962

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yearend figure; consumption was down about 6 percent. However, in sharp contrast to the stock position of retail dealers outside the producing region, inventories dropped 44 percent at docks on Lake Superior and 11 percent on Lake Michigan. At coke plants stocks remained virtually unchanged since the closing figure for 1963 of 114,000 tons represented a decrease of less than 2 percent.

FOREIGN TRADE

Data released by the Bureau of the Census, U.S. Department of Commerce, indicate that 3,353,000 net tons of Pennsylvania anthracite was exported in 1963, an increase of 86 percent over the 1962 figure. As in 1962, the entire net gain was attributable to a substantial increase in exports to Western Europe, since minor gains in shipments to Asia, Africa, and Oceania were almost offset by declines in exports to North, South, and Central America.

Census export data in table 35 show that 2,499,000 tons of anthracite were shipped to Europe in 1963, an increase of approximately 190 percent over the 1962 figure. However, this does not fully reflect the total movement of anthracite to the Continent, because the Bureau of the Census does not include in its figures coal shipped abroad for the use of our Armed Forces. According to data furnished to the Bureau of Mines by the Association of American Railroads, 860,800 tons were dumped at tidewater piers for shipment to West Germany. Of this amount, about 808,000 tons were intended for the use of U.S. Armed Forces in that country. A more accurate measurement of the importance of the export trade to the industry can be obtained, therefore, by adding this military tonnage to the Census data. Such an addition would show that about 861,000 tons were exported to West Germany and 3,308,000 to Europe as a whole. Also, the figure for total exports would approximate 4,162,000 net tons—23 percent of the 1963 production (nearly 1 ton out of every 4 produced) and the largest export volume since 1957.

Although no size data were available by the calendar-year, trade sources indicated the major part of exports in 1963 consisted of the larger sizes, thus helping the industry to absorb further losses in space-heating markets of the United States and Canada. The same sources reported, in addition, that prices obtained for export tonnages were generally higher than in 1962 and that demand for the smaller sizes also was considerably stronger. This development not only provided support for the entire price structure but also played an important role in raising average values at the preparation plants.

As indicated in footnote 9 to table 2, the Bureau of the Census discontinued issuing separate data on imports of anthracite beginning with September 1963. Since that date, the small quantities imported into the country have been combined with bituminous coal.

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TABLE 35.—Anthracite exported from the United States, by countries and customs districts

(Net tons)

Country	1962	1963
North America:		
Bahamas	22	
Canada	892,488	794,585
Canal Zone	11	27
Costa Rica		48
El Salvador	219	
Haiti	22	60
Honduras		13
Jamaica		122
Mexico	5,325	7,319
Miquelon	48	
Trinidad and Tobago	183	158
Total	898,318	802,332
South America:		
Argentina	5,119	
Brazil	10,370	5,336
Chile	257	529
Colombia	239	54
Peru		1,193
Surinam	29	38
Venezuela	201	8,094
Total	16,215	15,244
Europe:		
Belgium-Luxembourg	205,008	539,726
Denmark		50
France	140,703	723,964
Germany, West	[1] 244,011	52,163
Italy	140,413	259,946
Netherlands	133,183	829,118
Spain		93,791
Sweden		96
United Kingdom		334
Yugoslavia		155
Total	[1] 863,318	2,499,343
Asia:		
India	7,965	3,269
Iran		275
Israel	9,277	10,867
Japan		3,714
Philippines	85	277
Saudi Arabia	71	
Turkey	65	
Vietnam	5,605	14,583
Total	23,068	32,985
Africa: Tunisia		792
Oceania:		
Australia	805	2,433
New Zealand		63
Total	805	2,496
Grand total	[1] 1,801,724	3,353,192

Customs district	1962	1963
North Atlantic:		
Connecticut	42	
Maine and New Hampshire	324	128
New York	4,225	7,175
Philadelphia	[1] 1,013,166	2,668,320
South Atlantic:		
Maryland	3,958	9,159
Virginia	98	1,476
Gulf Coast:		
Florida	104	48
Galveston		2,750
Mobile	29	788
New Orleans	1,016	1,826
Sabine	6,283	481
Mexican border:		
Arizona	113	146
El Paso	19	
Laredo	4,639	6,510
Northern border:		
Buffalo	542,849	459,945
Dakota	111	
Duluth and Superior	404	1,167
Michigan	1,840	672
Ohio	3,793	1,688
Rochester	30,548	22,545
St. Lawrence	186,400	166,317
Vermont	968	1,524
Pacific Coast:		
Los Angeles	682	
Washington	113	527
Total	[1] 1,801,724	3,353,192

[1] Revised figure.

Source: Bureau of the Census.

NOTE.—According to the Association of American Railroads, 3,210,156 net tons of anthracite was exported to Europe in 1963, compared with 1,639,846 tons in 1962. Of this total, 860,800 tons was consigned to West Germany, including exports to the U.S. military forces. This compares with 948,847 tons for the same period in 1962.

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TABLE 36.—Anthracite imported for consumption in the United States, by countries of origin and U.S. customs districts

(Net tons)

Country and customs district	1962	1963 [1]	Country and customs district	1962	1963 [1]
Canada:			New Zealand:		
Buffalo		50	Philadelphia	2	
Hawaii	100	100			
Maine and New Hampshire	203		Grand total	7,583	4,625
Michigan		149			
Montana and Idaho	5,530	2,330			
Washington	1,748	1,996			
Total	7,581	4,625			

[1] Jan.–Aug. only. Beginning with Sept. 1, 1963, included with bituminous coal data.

Source: Bureau of the Census.

WORLD PRODUCTION

World production of anthracite totaled 202 million tons in 1963, according to estimates and data reported by several sources, an increase of approximately 2 percent over the revised figure for 1962. In Europe, relatively small tonnage increases were reported for Belgium, West Germany, and the United Kingdom; however, the estimated decline of 2.7 million tons in France placed the total for Great Britain and the Continent well below the 1962 output. Elsewhere, the most significant increases occurred in the United States, North Vietnam, and North and South Korea, with the latter more than doubling its production since 1959 with U.S. aid. Production of the U.S.S.R., largest anthracite-producing country in the world, was estimated at 88 million tons in 1963, a gain of slightly less than 1 percent. World production of anthracite for the 5-year period, 1959–63, is shown in table 37.

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TABLE 37.—World production of anthracite, by countries[1]

(Thousand short tons)

Country	1959	1960	1961	1962	1963
Belgium	7,059	6,488	6,085	6,345	6,598
Bulgaria	165	177	210	217	238
China[2]	22,000	24,800	22,000	22,000	22,000
France	13,785	13,683	12,849	12,942	[2] 10,260
Germany:					
East[2]	275	275	275	275	275
West	13,902	13,257	13,803	14,351	14,969
Ireland	171	143	129	131	144
Italy	34	22	26	18	15
Japan	1,781	1,987	2,088	2,065	1,982
Korea:					
North	6,101	7,471	8,300	9,900	10,700
Republic of	4,559	5,897	6,486	8,206	9,764
Morocco	513	454	452	408	445
Netherlands[2]	4,400	4,400	4,400	4,400	4,300
New Zealand	2	1	(3)	1	(3)
Peru	65	34	23	24	14
Portugal	581	480	518	446	459
Rumania[2]	17	17	17	17	17
South Africa, Republic of	777	709	1,429	1,224	1,270
Spain	2,888	2,771	2,863	2,913	3,094
Switzerland[2]	11	11	11	11	11
U.S.S.R.	87,423	85,995	85,405	[2] 87,000	[2] 88,000
United Kingdom	4,039	4,026	3,973	4,371	4,658
United States (Pennsylvania)	20,649	18,817	17,446	16,894	18,267
Vietnam:					
North	2,427	2,860	3,118	3,823	[2] 4,400
South	22	30	63	78	115
World total (estimate)[1]	193,600	194,800	192,000	198,100	202,000

[1] This table incorporates revisions of data published in previous anthracite chapters. Data do not add to totals shown because of rounding where estimated figures are included in the detail.
[2] Estimate.
[3] Less than 500 tons.

NOTE.—An undetermined amount of semianthracite is included in figures for some countries.

TECHNOLOGY

Mining.—The installation, and early operating results, of the Bureau hydraulic miner that was installed in a mine of a cooperating company has been described previously by.[2 3] The hydraulic miner is located in a seam 10 to 15 feet thick on a pitch of 0° to 15°, with water being supplied from the surface by a nonuplex pump at a capacity of 300 gpm and 5,000 psi. Early in 1963 the hydraulic system passed from the development to the testing stage. Unsuccessful efforts were made to correlate slot-cutting tests with mining-out rate. A revised experiment was then designed to measure the effect of seven factors: Line pressure, water volume at the face, depth of cut, number of mast setups, rate of nozzle movement, cutting pattern (horizontal versus vertical), and angle of jet impact. Two values were assigned to each factor for the half-replication experiment in which 64 test cuts were to be made in 8 blocks.

Four blocks had been completed by the end of 1963. After 2 were completed a statistical analysis indicated that jet angle, pressure, and volume were the only significant factors, although cutting pattern had begun to assume some importance. After the 32 tests had been

[2] Buch, John W., and Ivor D. Williams. Hydraulic Mining of Anthracite—Experiments at the Sugar Notch Mine, Wilkes-Barre, Pa. Min. Cong. J., v. 48, No. 7, July 1962, pp. 22–28.
[3] Buch, John W. L' Abbattage Hydraulique d'Anthracite (Hydraulic Mining of Anthracite). Conf. Internat. sur L'Advancement Rapide dans les Chantiers d'Exploitation des Mines de Houille, Liege, Sept. 30–Oct. 5, 1963, paper E6, 12 pp.

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finished, further analysis showed that pressure, volume, pattern, and jet-traverse speed were the most meaningful factors. The highest mining rate obtained—1.3 tons per minute with power consumption at 8.5 kwhr/ton—was achieved under the following conditions: Pump pressure, 5,000 psi; water volume, 300 gpm; depth of cut, 6 feet; mast set-ups, 3; speed of jet travel, 24 ips; pattern of cut, horizontal; and, impact of jet stream, 25°.

As the tests proceeded, it became apparent that full automation of the cutting cycle would be needed if the potential of the device were to be realized. Hence, an outside concern was awarded a contract to design, build, and install a sonar detector to control the movement of the jet through a predetermined cutting pattern. As rock intrusions occur frequently in the anthracite fields, the appearance of a massive fine-grain quartz agglomerate was fortunate in that it provided an excellent opportunity to test the hydraulic jet for rock cutting. The intrusion—about 2.5 feet thick and 22 feet wide—was completely removed by the jet in approximately 4 hours of cutting time.

The Bureau-designed prototype hydraulic-hoisting system[4] was further developed by adding several automatic and safety devices. Automation of the charging apparatus was completed by installing the storage bin directly above the feeder system, consisting of two lock-hopper units discharging into a horizontal section of the hoist pipeline. Safe operation of all movable components was insured by attaching interlocking safety switches on the compressed air actuators for the lock gates and valves.

Preparation.—In 1963 the Bureau continued its investigation of fine-grinding techniques at the Anthracite Research Center, Schuylkill Haven, Pa. Past efforts to produce anthracite in the carbon-black size range (50°–5,000° A) with fluid-energy, impact, and air-swept ball mills were largely unsuccessful both in producing 1-micron material and in establishing firmly the minimum size to which anthracite can be ground. However, further batch grinding in the ball mill produced several batches with average diameters in the 2 to 4 micron range, with one containing 18 percent minus 1-micron material. During the work, a micrographic procedure was developed to check two indirect methods (MSA and Fisher subsieve sizer) for measuring diameters of coal particles. A statistical comparison of results from the three procedures was underway at the end of the year.

Twelve tests were run during 1963 on cleaning single and multisized feeds with heavy media. At a specific gravity of 1.76 and feeds from 450 to 1,960 lbs. per hr., buckwheat No. 1 was recovered at efficiencies as high as 99.9 percent, followed by buckwheat No. 2 (rice) at 95 to 98 percent, and buckwheat No. 3 (barley) at about 90 percent, with approximately 9 percent being misplaced refuse material. Cleaning a 50–50 mixture of No. 1 and rice presented no difficulties, but the separation efficiency declined as much as 10 percent more than that obtained when cleaning the sizes separately. A study was also undertaken to determine the feasilibity of preparing anthracite containing 1 percent ash, or less. It was found that egg size (3¼″–2$^{7}/_{16}$″) anthracite, containing 9.5 percent ash, could be reduced to the desired ash

[4] Dierks, H. A., and H. B. Link. Development of a Lock-Hopper Feeder for Hydraulic Hoisting of Coal. BuMines Rept. of Inv. 6347, 1964, 27 pp.

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content by successive washing, grinding, and screening—although yields were extremely low.

One of the research projects supported by the Pennsylvania Coal Research Board and conducted by the Department of Mineral Preparation, College of Mineral Industries, the Pennsylvania State University was concerned with finding a suitable concentration process for recovering valuable coal from the enormous quantities of low-grade anthracite silts [5] found in the State. Because of their extremely small-particle size, high-ash content, and difficulty of cleaning with customary methods and equipment, most silts are considered waste material. However, using a four-stage flotation system—one rougher and three cleaners—for recovering coal from three silts containing 40 to 53 percent ash and 36 to 82 percent minus 400-mesh particles—the recovery rate of combustible material ranged from 80 to 85 percent and ash content from 14 to 16 percent. The procedure described was also successful in removing clays, which present difficulties in feeding silts into powerplant furnaces.

Surface Properties.—Bureau investigations of the surface characteristics of anthracite are intended not only to extend fundamental knowledge of the subject, which might lead to new uses, but to establish criteria upon which the effectiveness of physical or chemical treatment could be based. In 1963, research apparatus was adapted to determine the density of anthracite in helium; studies were conducted to ascertain the relationship of density to particle size, to several other physical properties, and to gamma radiation—in both the presence and the absence of air. Consideration was also given to effects on true density (helium method), specific gravity (ASTM), and specific pore volume. The conclusion was reached that low-volatile anthracite provides the highest density value (up to 1.76 before ash correction) and that high-volatile samples had considerably lower specific pore volume than medium- or low-volatile specimens of the same anthracite.

In an effort to better determine the chemical and physical composition of anthracite, the Department of Geochemistry and Mineralogy, College of Mineral Industries, the Pennsylvania State University also conducted for the Coal Resource Board an investigation [6] involving treatment of anthracite under pressures and temperatures considered higher than those associated with its formation. Hydrothermal apparatus was used for studies on sealed samples up to 900° C. and 20,000 psi, and high-pressure apparatus, with smaller samples, up to 700° C. and 450,000 psi. Fusion of anthracite, not previously reported in the literature, was achieved at pressures of 2,000 psi at about 425° C. The results also permitted some estimate of metamorphic processes in formation of anthracite, which might be useful in developing processes for production of special carbons.

The Bureau also continued research studies on the electrical resistivity of anthracite to broaden knowledge of its physical properties and to possibly develop simple tests for differentiating between coals and identifying unique properties that might lead to new uses.

[5] Liu, H. S., and S. C. Sun. Coal Flotation of Low-Grade Pennsylvania Anthracite Silts. Coal Research Board of the Commonwealth of Pennsylvania, Special Res. Rept. SR–39, May 1963, 126 pp.

[6] Hryckowian, Eugene, Frank Dachille, Russel R. Dutcher, and R. Roy. Studies of Anthracite Coals at High Pressures and Temperatures. Coal Res. Board of the Commonwealth of Pennsylvania, Special Res. Rept. SR–38, April 1963, 64 pp.

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Studies on the effect of gamma radiation upon the physical and electrical properties of anthracite were also continued in 1963. The major part of the work was devoted to a study of the effect of radiation on the reaction between anthracite and fluorine. Tests were conducted at several temperatures, gas-flow rates, and concentrations with procedures based on gas chromatographic and infrared spectroscopic techniques. It was found that the reaction between anthracite and undiluted fluorine is explosive in the presence of radiation at temperatures of 40° to 45° C. In the absence of radiation, but under similar conditions, the reaction proceeded smoothly.

Utilization.—In connection with Bureau efforts to re-establish anthracite as a major metallurgical fuel, studies being conducted in cooperation with a major steel company were extended to determine the effect upon pressure drop of various raw materials used in blast furnaces. Tests using pellets or sinter with furnace coke or anthracite briquets were run on burdens simulating those used in actual plant practice. Evidence was found that changes in bed permeability may occur at fairly definable air rates in both the low- and high-velocity ranges. In an equal-weight-of-fuel study employing the standard-layering procedure, the permeability of pellet burdens was measured using pillow-shaped briquets and furnace coke. Slopes or n, from a 3 to 12 fps range, were found to be 1.99 when using briquets and 1.87 when employing coke. The average pressure drop per foot of bed depth measured 11 to 33 percent higher with briquets than coke; however, with both, pressure drop increased with air velocity. In a second study also involving standard-layering procedures and equivalent fuel weights, n values obtained for sinter-briquet and sinter-coke mixes were found to be essentially the same as for pellet-briquet burdens. Average pressure drop, based on bed depth (usually 25 percent less with briquets than with coke), was found to be 33 to 38 percent higher with briquets than with coke. However, when comparative measurements were made of total pressure drop through beds of equal weight, the permeability of sinter-briquet burdens was found to vary less than plus or minus 2 percent from that obtained for sinter-coke.

By the end of 1963, most of the equipment had been installed and hydrostatically tested at the Anthracite Research Center for the Bureau experimental program on hydrogasification of anthracite. Fluidization tests were started in a simulated-plastic-fluidization apparatus on a variety of mesh sizes, but had been completed only on a 40 by 50 mesh anthracite. Visual observation of the phenomena prevailing in the pseudoreactor and correlations of the data and bed behavior are expected to result in establishment of a range of permissible operating conditions.

In 1963, the pilot plant and equipment used at the Center to produce experimental anthracite metallurgical briquets were modified so as to change slightly the shape of the briquet pocket and to increase productive capacity. The change in shape reduced the average density of the briquets, after calcination, by 0.15 to 1.18 gms/cc from that of pillow-shaped briquets. Further attempts were also made to employ industrial-type furnaces for continuous calcination of pillow-shaped

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anthracite briquets, as well as the Bureau traveling-grate stoker, but with unsatisfactory results.

Preliminary investigations were instituted during the year at the Anthracite Research Center on using anthracite as a colloidal fuel and on the characteristics of acid mine water. Initial effort on the former was centered on devices for dewatering fine-sized material, since the quantity of water in the delivered fuel will adversely affect heating value. Gravity drainage, vacuum filtration, and centrifugal force were not effective in determining the wetting characteristics of anthracite. Anthracite-water slurries were separated successfully by a machine utilizing centrifugal force to atomize water so that it could be driven off by a sweeping current of air. At the close of the year, work on acid mine water was progressing in three phases: (1) A study of the mechanics of water-contaminant formation, (2) chemical characteristics of various pollutants in samples of mine water and in synthetic analagous systems, and (3) an exploration of methods considered most applicable to the practical treatment of mine water.

Mine Water Control.—Public Law 162, Act of July 15, 1955, which provided the authority for the Department of the Interior to engage in mine-drainage control activities in cooperation with the Commonwealth of Pennsylvania, was amended October 15, 1962, by Public Law 87–818 to permit sealing abandoned coal mines and filling voids in such mines when the work is determined to be in the interest of public health and safety. In 1963, several flood-control proposals, two deep-well-pump projects, and three surface-improvement projects were investigated by the Bureau of Mines. In addition, two projects involving backfilling and another on an abandoned strip pit were evaluated under terms of the amendment. By the end of the year, one project had been approved by the Secretary of the Interior—Project No. 1, providing for backfilling mine voids under and adjacent to the GAR High School in Wilkes-Barre, Pa., to protect more than 300 residences and other buildings from subsidence damage. This project will cost about $640,000, of which the Federal government will pay one-half.

Microfilming.—The program initiated in 1962 by the Bureau to microfilm all available data on abandoned mining operations in the anthracite region was accelerated during the latter part of 1963. By year-end, maps and cross sections of 39 mines had been placed on film. This record was supplemented by filming the maps, cross sections, and correlation sheets included in the Bureau study for the U.S. Army Corps of Engineers of underground conditions in the Wyoming region.

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Coke and Coal Chemicals

By J. A. De Carlo [1] and E. T. Sheridan [2]

Contents

	Page
General summary	225
Scope of report	231
Oven and beehive coke and breeze	232
Production by merchant and furnace plants	232
Production by States	235
Screenings or breeze	236
Disposal	238
Consumption and sales	238
Geographic distribution	243
Stocks of coke and breeze	245
Value and price	246
Foreign trade	248
Imports	248
Exports	248
World production	251
Hard coke	252
Soft coke	253
Coke ovens	254
Slot ovens	254
Beehive ovens	255
Coking coal	257
Quantity and value of coal carbonized	257
Preparation of coking coal	260
Washed and unwashed coals	260
Blending	262
Sources	263
Captive coal	265
Stocks	266
Bituminous coal, by months	266
Anthracite, by months	267
Technology	267
Coal chemicals	272
General review	272
Coke-oven gas	277
Coke-oven ammonia	279
Crude coal tar and derivatives	281
Crude light oil and derivatives	283

GENERAL SUMMARY

The coke industry responded to the 5-percent increase in industrial production with a 5-percent gain in output. The general improvement in industrial activity beginning in the last quarter of 1962 continued through the first half of 1963, but leveled off in the summer months and remained at a uniformly high rate in the latter part of the year. Consequently, the monthly production index of oven coke (1957–59=100) was higher in the first 6 months of 1963 than in the last half. In the first 6 months, the index averaged 90.1 percent of the 1957–59 average, dropping to 84.7 in the third quarter, and then increasing to 87.3 in the last quarter. Coke plants associated with iron and steel plants, classified by the Bureau of Mines as furnace plants, operated at a higher rate than the merchant group, averaging 89.6 for the year compared with 76.5 for the latter. Activity in the beehive segment of the coke industry closely followed the trend of oven coke as output reached a peak in May, dropped slightly in the summer months and leveled off and remained at a uniform rate in

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the last quarter. Although production of beehive coke increased 20 percent in 1963, it represented less than 2 percent of the combined oven and beehive output.

The apparent consumption of coke in 1963, allowing for imports, exports, and changes in producers' stocks, increased 6 percent over that of 1962 and totaled more than 55 million tons. The principal factor in the increase in consumption was the 6-percent increase in shipments to iron-blast furnaces. Blast furnaces continued to utilize the bulk of the nation's coke output, receiving approximately 90 percent of the total shipments from coke plants. Blast-furnace coke rates continued to drop as a result of the steady improvements in blast-furnace burden materials (coke and iron ore) and operating techniques. According to data published by the American Iron and Steel Institute, blast-furnace coke rates since the 1957–59 period have decreased 17 percent or 283.9 pounds per short ton of pig iron and ferroalloys produced. In 1963, an average of only 1,350.5 pounds of coke per ton of hot metal produced was achieved, the lowest coke rate on record.

Another metallurgical application that showed an increase in 1963 over the 1962 total was in iron- and steel-foundry operations. Shipments to iron and steel foundries increased 227,345 tons or 9 percent. Although foundry coke represented only 5 percent of the total quantity of coke used or sold, the value of foundry coke represented 9 percent of the value of all coke largely because of the higher prices received for foundry coke. Shipments to other industrial plants which included coke used for chemical processing, nonferrous smelting, and various other industrial applications increased 7 percent and were equivalent to 4 percent of the total coke movement. Shipments to producer-gas and water-gas plants and for residential heating continued to decline and could no longer be considered major coke markets.

Imports and exports of coke were higher in 1963 than in 1962, with imports rising 8 percent and exports 24 percent. As in preceding years, approximately 94 percent of the coke imported originated in Canada and more than 80 percent of the exports were destined to that country.

Production of coke screenings or breeze increased 5 percent over that of 1962. This material which, in weight, represented nearly 5 percent of the coal carbonized is used as an industrial fuel for a variety of purposes, but the bulk is used by the producing companies in iron-ore agglomerating plants, for steam raising, and for miscellaneous purposes at iron and steel works. Until the mid 1950's breeze was used mainly for steam raising at or near producing plants. The consumption pattern has shifted in recent years, however, and the largest quantities now are used for agglomerating iron ore. According to data supplied by producers, 64 percent of the 2.8 million tons of breeze consumed by producers in 1963 was used in iron-ore agglomerating plants, 22 percent was used for steam raising, and 14 percent for a variety of other industrial uses. The demand for breeze increased and sales rose 21 percent over the 1962 sales. A large proportion of the breeze sold apparently was shipped to elemental-phosphorus producers that are estimated to have used more than 700,000 tons to smelt phosphate rock.

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Delivered costs of coal to coke plants dropped to the lowest level since 1956. Increased productivity in the bituminous-coal industry and a reduction in freight rates on coking-coal shipments were responsible for the decline in delivered coal costs. Coal costs at oven-coke plants dropped $0.36 per short ton and $0.17 at beehive plants. As beehive plants are located at or near the source of coal, carbonized coal costs were roughly equal to f.o.b. mine prices because transportation charges were negligible. Generally, coal costs were highest at oven-coke plants farthest from the sources of their coal supply.

Production of the four basic coal-chemical materials (crude tar, crude light oil, ammonia, and gas) were all higher in 1963 than in 1962. The output of crude tar and crude light oil rose 3 percent; ammonia, 7 percent; and gas, 5 percent. Yields of the basic chemical raw materials showed only minor changes from 1962 with yields of ammonia and gas increasing slightly while yields of tar and light oil dropped 0.08 and 0.03 of a gallon, respectively. The increased ammonia supply resulted in production increase of 6 percent for ammonium sulfate, 8 percent for ammonia liquor, and 30 percent for diammonium and monoammonium phosphate. Although the output of crude light oil and crude tar increased substantially over 1962, output of their derivatives decreased, because of a cessation of processing at a number of oven-coke plants. For example, the quantity of crude light oil sold to tar distillers and petroleum refiners rose from 27,017,854 gallons in 1962 to 32,610,305 gallons in 1963. As a result, coke-plant operators who usually had been refining about 95 percent of the light-oil output on the premises, refined only 85 percent in 1963. The decline in the quantity of tar processed by coke-plant operators was caused by the closing of several tar-distillation units for modernization, and one closed permanently for economic reasons.

Prices of beehive- and oven-foundry coke did not change during 1963, but prices on commercial sales of breeze declined $0.54 per ton or 7 percent. There were, however, several important price changes on certain coal chemicals. The most significant development was the substantial drop in naphthalene prices in the latter part of the year. The drop from $0.0525 to $0.0325 per pound was caused largely by competitive pressure from orthoxylene, an alternate phthalic-anhydride feedstock obtained by processing certain petroleum fractions. Benzene prices leveled off in 1963 after several price cuts in 1962, but prices on both toluene and xylene were reduced in 1963. Toluene prices were reduced $0.04 per gallon to $0.21 in July, and xylene prices declined from $0.27–0.30 to $0.25–0.26 per gallon at the same time. A fertilizer material that did advance in price was ammonium sulfate which increased $2 per ton in July. This increase, however, was not large enough to offset the low prices of the first half of the year, and average returns to oven-coke-plant operators for 1963 on ammonium sulfate, diammonium phosphate, and ammonia liquor were lower than in 1962.

The total value of coal carbonized in 1963 increased 1 percent from that of 1962 and totaled $734,100,949. The value of all coke-oven products used and sold amounted to $1,231,280,299 or 68 percent more than the value of the coal. The value of coke and breeze amounted to 79 percent of the value of all coke-oven products.

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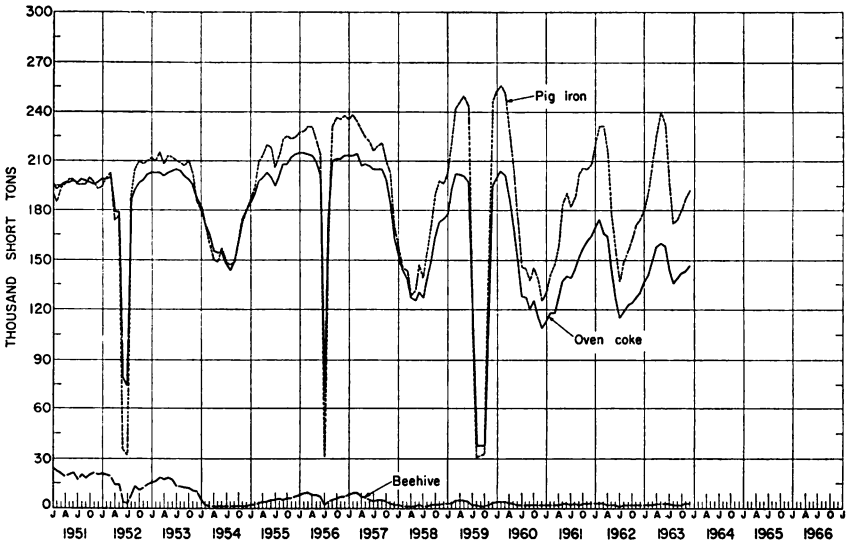
THOUSAND SHORT TONS
300
270
240
210
180
150
120
90
60
30
0
Pig Iron
Oven coke
Beehive
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1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966

FIGURE 1.—Average daily production of oven and beehive coke and pig iron in the United States, by months.

TABLE 1.—Salient coke statistics in the United States

	1957–59 (average)	1961	1962	1963
United States:				
Production:				
Oven coke—short tons	60,551,900	50,830,409	51,098,420	53,307,609
Beehive coke—do	1,254,232	880,778	811,872	970,698
Total—do	61,806,132	51,711,187	51,910,292	54,278,307
Imports—do	120,908	126,518	141,883	152,595
Exports—do	558,428	445,232	[1] 364,032	451,241
Producers' stocks, Dec. 31—do	[2] 4,682,436	4,041,873	3,906,811	2,884,931
Consumption, apparent—do	60,585,947	52,088,688	[1] 51,823,205	55,001,541
Ovens:				
Slot in existence, Dec. 31	[2] 15,993	15,224	[1] 14,561	14,586
Beehive in existence, Dec. 31	[2] 7,448	5,702	4,979	4,907
Value of coal-chemical materials used or sold	$330,902,284	$279,349,011	$264,739,789	$254,220,290
Value of coke and breeze produced	1,143,589,918	943,542,537	963,211,681	977,060,009
Total value of all products	1,474,492,202	1,222,891,548	1,227,951,470	1,231,280,299
World production:				
Hard coke—thousand short tons	287,855	[1] 299,845	[1] 301,020	313,236
Gashouse and low-temperature coke—thousand short tons	51,130	[1] 49,700	[1] 50,380	50,120

[1] Revised figure.
[2] 1959.

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TABLE 2.—Statistical summary of the coke industry in the United States in 1963

	Slot ovens	Beehive ovens	Total
Coke produced—			
At merchant plants:			
Short tons	5,626,701	(1)	(1)
Value	$121,421,865	(1)	(1)
At furnace plants:[2]			
Short tons	47,680,908	(1)	(1)
Value	$815,540,322	(1)	(1)
Total:			
Short tons	53,307,609	970,698	54,278,307
Value	$936,962,187	$14,929,656	$951,891,843
Breeze produced:			
Short tons	3,608,806	29,606	3,638,412
Value	$25,107,301	$60,865	$25,168,166
Coal carbonized:			
Bituminous:			
Short tons	76,019,529	1,612,581	77,632,110
Value	$721,094,195	$8,287,970	$729,382,165
Average per ton	$9.49	$5.14	$9.40
Anthracite:			
Short tons	450,509	----------	450,509
Value	$4,718,784	----------	$4,718,784
Average per ton	$10.47	----------	$10.47
Total:			
Short tons	76,470,038	1,612,581	78,082,619
Value	$725,812,979	$8,287,970	$734,100,949
Average per ton	$9.49	$5.14	$9.40
Average yield in percent of total coal carbonized:			
Coke	69.71	60.20	69.51
Breeze (at plants actually recovering)	4.72	6.38	4.73
Coke used by producing companies—			
In blast furnaces:			
Short tons	46,879,469	(3)	46,879,469
Value	$799,712,515	(3)	$799,712,515
In foundries:			
Short tons	227,854	----------	227,854
Value	$6,907,255	----------	$6,907,255
For producer- and water-gas manufacture:			
Short tons	50,100	----------	50,100
Value	$986,357	----------	$986,357
For other industrial uses:			
Short tons	430,072	----------	430,072
Value	$7,783,448	----------	$7,783,448
Breeze used by producing companies—			
In steam plants:			
Short tons	609,518	----------	609,518
Value	$3,847,353	----------	$3,847,353
In agglomerating plants:			
Short tons	1,794,566	----------	1,794,566
Value	$12,553,467	----------	$12,553,467
For other industrial uses:			
Short tons	388,499	----------	388,499
Value	$2,455,041	----------	$2,455,041
Coke sold (commercial sales)—			
To blast furnaces:			
Short tons	2,279,434	424,286	2,703,720
Value	$35,096,802	$6,218,766	$41,315,568
Average per ton	$15.40	$14.66	$15.28
To foundries:			
Short tons	2,511,183	18,654	2,529,837
Value	$75,899,475	$275,165	$76,174,640
Average per ton	$30.22	$14.75	$30.11
To water-gas plants:			
Short tons	24,769	----------	24,769
Value	$491,480	----------	$491,480
Average per ton	$19.84	----------	$19.84
To other industrial plants:			
Short tons	1,261,968	525,027	1,786,995
Value	$19,641,374	$8,396,364	$28,037,738
Average per ton	$15.56	$15.99	$15.69
For residential heating:			
Short tons	515,843	1,459	517,302
Value	$7,875,290	$13,648	$7,888,938
Average per ton	$15.27	$9.35	$15.25

See footnotes at end of table.

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TABLE 2.—Statistical summary of the coke industry in the United States in 1963—Continued

	Slot ovens	Beehive ovens	Total
Breeze sold (commercial sales):			
Short tons	954,223	30,206	984,429
Value	$7,000,292	$62,010	$7,062,302
Average per ton	$7.34	$2.05	$7.17
Coal-chemical materials produced:			
Crude tar:			
Gallons	671,875,628		671,875,628
Gallons per ton of coal	8.78		8.78
Ammonia: [4]			
Short tons	718,778		718,778
Pounds per ton of coal	19.23		19.23
Crude light oil:			
Gallons	218,165,707		218,165,707
Gallons per ton of coal	2.91		2.91
Gas:			
Thousand cubic feet	800,582,375		800,582,375
Thousand cubic feet per ton of coal burned	10.47		10.47
Percent burned per ton of coal in coking process	34.67		34.67
Percent surplus used or sold	64.47		64.47
Percent wasted	.86		.86
Value of coal-chemical materials used or sold:			
Crude tar and derivatives:			
Used	$25,731,719		$25,731,719
Sold	$54,962,419		$54,962,419
Ammonia products [5]	$20,617,202		$20,617,202
Crude light oil and derivatives [6]	$36,187,898		$36,187,898
Surplus gas	$116,721,052		$116,721,052

[1] Not separately recorded.
[2] Plants associated with iron-blast furnaces (refer to definition in "Scope of Report").
[3] Included with sales to avoid disclosing individual company data.
[4] In terms of sulfate equivalent.
[5] Includes ammonium sulfate, ammonia liquor (NH_3 content), and diammonium and monoammonium phosphate.
[6] Includes intermediate light oil.

TABLE 3.—Summary of oven-coke operations in the United States in 1963, by States

State	In existence Dec. 31 [1]		Coal carbonized (short tons)	Yield of coke from coal (percent)	Coke produced (short tons)	Value of coke at ovens	
	Plants	Ovens				Total	Per ton
Alabama	7	1,516	5,893,990	72.64	4,281,587	$88,209,688	$20.60
California, Colorado, Utah	3	773	3,835,064	62.80	2,408,363	58,151,574	24.15
Connecticut, Maryland, New Jersey, New York	6	1,752	9,140,927	69.52	6,354,716	104,478,953	16.44
Illinois	6	568	2,768,559	67.59	1,871,204	35,440,208	18.94
Indiana	5	2,218	10,835,622	69.60	7,541,430	145,818,862	19.34
Kentucky, Missouri, Tennessee, Texas	5	438	2,837,992	70.84	2,010,349	35,952,841	17.88
Michigan	4	733	4,742,405	72.96	3,460,027	62,839,859	18.16
Minnesota and Wisconsin	3	380	978,994	80.38	786,923	17,717,594	22.52
Ohio	12	1,820	9,088,258	69.76	6,339,546	111,068,683	17.52
Pennsylvania	12	3,720	21,895,971	69.62	15,245,046	227,269,368	14.91
West Virginia	3	668	4,452,256	67.57	3,008,418	50,014,557	16.62
Total 1963	66	14,586	76,470,038	69.71	53,307,609	936,962,187	17.58
At merchant plants	17	1,894	7,923,028	71.02	5,626,701	121,421,865	21.58
At furnace plants	49	12,692	68,547,010	69.56	47,680,908	815,540,322	17.10
Total 1962	66	[2]14,561	73,342,847	69.67	51,098,420	927,064,568	18.14

[1] Excludes plants retired permanently during year.
[2] Revised figure.

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TABLE 4.—Summary of beehive-coke operations in the United States in 1963, by States

State	In existence Dec. 31 [1]		Coal carbonized (short tons)	Yield of coke from coal (percent)	Coke produced (short tons)	Value of coke at ovens	
	Plants	Ovens				Total	Per ton
Pennsylvania	18	3,636	624,332	61.50	383,979	$5,371,354	$13.99
Kentucky, Virginia, West Virginia	8	1,271	988,249	59.37	586,719	9,558,302	16.29
Total:							
1963	26	4,907	1,612,581	60.20	970,698	14,929,656	15.38
1962	27	4,979	1,338,862	60.64	811,872	12,146,630	14.96

[1] Excludes plants retired permanently during year.

SCOPE OF REPORT

This chapter covers high-temperature oven and beehive coke and related products. All data, except where noted, were supplied by coke-producing companies in the United States. Only products made in high-temperature slot and beehive ovens were included; products made by other carbonization processes (coal-gas retorts, low-temperature coal carbonization, and carbonization of residues from the refining of coal tar and petroleum) were specifically excluded. Approximately 16.1 million tons of petroleum coke also was produced in 1963. Although some coal-tar-pitch coke was produced in 1963, data on production is withheld to prevent the disclosure of individual company statistics.

In addition to coke produced in high-temperature slot and beehive ovens, five companies produced 160,000 tons of coke and char in unconventional carbonizing units. Of the five producers, one manufactured a low-temperature coke known as "Disco" by a continuous process. Another producer carbonized lignite in a Lurgi gasifier and manufactured briquets from the char. Three plants produced high-temperature coke with traveling-grate stokers.

Of the 67 oven-coke plants surveyed by the Bureau of Mines in 1963, 63 were active all year, 3 were idle all year, and 1 was active part of the year but later was closed permanently. Of the 30 beehive plants surveyed, only 11 operated the entire year, 4 were active part of the year, and the remainder were idle.

The terms "merchant" and "furnace" in this chapter apply only to oven-coke plants. Furnace plants are owned by, or are financially affiliated with, iron and steel companies that produce coke mainly for use in their blast furnaces. Merchant plants include those that manufacture metallurgical, industrial, and residential-heating grades of coke for sale on the open market; those associated with chemical companies or gas utilities; and those affiliated with local iron works that consume only a small part of their output in affiliated blast furnaces.

Data on plant capacities, published annually since 1880 for beehive-coke plants and since 1893 for oven-coke plants, cannot be shown because a large segment of the oven-coke industry reported that this information was no longer available for publication.

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Although data were not available on the manufacturing costs of coke and coal chemicals, this chapter shows the delivered values of coals carbonized and plant values of products produced and sold. The average values shown for coals carbonized were based upon market values assigned by coke producers to all coal received, whether obtained from captive or commercial mines. The average values of oven and beehive coke produced (including coke used by producers and coke sold) were based upon reports from producers showing receipts, f.o.b. plant, for commercial sales and upon prevailing market values for coke consumed by producers. Average values for coal chemicals were based upon the total realization, f.o.b. plant, from commercial sales of the various commodities.

In this chapter, "coke" refers only to large sizes (usually one-half inch plus) from which smaller sizes (breeze) have been screened. "Metallurgical coke" refers to grades used for smelting and casting ferrous metals in blast furnaces and foundries. The standard unit of measurement is the short ton of 2,000 pounds.

OVEN AND BEEHIVE COKE AND BREEZE

PRODUCTION BY MERCHANT AND FURNACE PLANTS

Statistics on production of oven coke, separated according to merchant and furnace plants for 1963 and selected prior years, are presented in tables 6 and 7. These data show that, compared with 1962, production increased in both segments of the industry but was far less than for the 1957–59 period. Economic and technologic factors contributing to the general decline in production in recent years have been published repeatedly in previous editions of this chapter and need not be reiterated. Although production at furnace plants decreased from the high levels attained during the 1950's, the percent of decrease was much lower than at merchant plants.

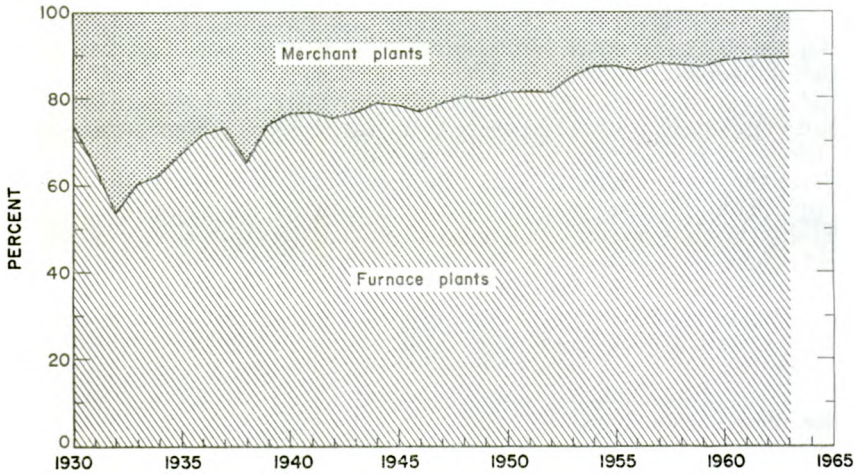

FIGURE 2.—Production of oven coke in the United States, by type of plant.

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Thus, production at furnace plants in 1963 was 27 percent less than the peak attained in 1957, whereas the 1963 output at merchant plants was 63 percent less than their record high of 1942. The downward trend in production at merchant plants reduced the proportion of the annual total oven-coke supply furnished by this group of plants, as is illustrated in figure 2.

Coke is a special-purpose fuel used mainly in a wide variety of industrial applications ranging from chemical processing to iron and steel smelting and casting operations. For this reason, monthly production of coke at both merchant and furnace plants is generally uniform depending on industrial activity. Although there were some fluctuations in coke output from month to month in 1963, no serious interruptions severely restricted production because of work stoppages or other factors. Consequently, merchant-plant output ranged from

TABLE 5.—Production of oven and beehive coke in the United States, by months[1]

(Short tons)

Month	1957-59 (average)		1961		1962		1963	
	Total	Daily average	Total	Daily average	Total	Daily average	Total	Daily average
Oven coke:								
January	5,630,000	181,600	3,494,400	112,700	5,273,400	170,100	4,244,600	136,900
February	5,159,400	184,300	3,297,800	117,800	4,866,900	173,800	3,953,800	141,200
March	5,744,700	185,300	3,655,300	117,900	5,154,100	166,300	4,627,500	149,300
April	5,378,300	179,300	3,798,700	126,600	4,926,300	164,200	4,740,300	158,000
May	5,532,400	178,500	4,251,100	137,100	4,451,800	143,600	4,963,400	160,100
June	5,352,800	178,400	4,211,300	140,400	3,786,800	126,200	4,734,100	157,800
July	4,603,300	148,500	4,320,200	139,400	3,550,400	114,500	4,466,500	144,100
August	4,151,700	133,900	4,465,700	144,100	3,690,900	119,100	4,200,400	135,500
September	4,121,500	137,400	4,558,400	152,000	3,691,300	123,100	4,157,200	138,600
October	4,340,000	140,000	4,863,800	156,900	3,850,900	124,200	4,390,600	141,600
November	5,002,600	166,800	4,822,300	160,700	3,822,600	127,400	4,289,000	143,000
December	5,535,200	178,500	5,091,400	164,300	4,033,000	130,100	4,540,200	146,500
Total	60,551,900	165,900	50,830,400	139,300	51,098,400	140,000	53,307,600	146,000
Beehive coke:								
January	132,200	4,300	63,100	2,100	102,200	3,300	66,400	2,200
February	127,900	4,500	60,300	2,100	93,900	3,400	67,100	2,400
March	150,300	4,900	68,500	2,200	97,600	3,100	66,900	2,100
April	138,900	4,600	66,200	2,200	70,400	2,400	87,600	2,900
May	118,700	3,800	80,700	2,600	59,000	1,900	102,000	3,300
June	107,900	3,600	78,500	2,600	54,100	1,800	96,200	3,200
July	80,000	2,600	72,300	2,300	43,800	1,400	84,200	2,700
August	82,600	2,700	84,200	2,700	50,400	1,600	79,500	2,600
September	78,600	2,600	73,000	2,400	51,900	1,700	79,000	2,600
October	75,300	2,400	81,000	2,600	63,900	2,100	82,600	2,700
November	76,100	2,500	75,000	2,500	65,900	2,200	77,600	2,600
December	85,700	2,800	78,000	2,500	58,800	1,900	81,600	2,600
Total	1,254,200	3,400	880,800	2,400	811,900	2,200	970,700	2,700
Total:								
January	5,762,200	185,900	3,557,500	114,800	5,375,600	173,400	4,311,000	139,100
February	5,287,300	188,800	3,358,100	119,900	4,960,800	177,200	4,020,900	143,600
March	5,895,000	190,200	3,723,800	120,100	5,251,700	169,400	4,694,400	151,400
April	5,517,200	183,900	3,864,900	128,800	4,996,700	166,600	4,827,900	160,900
May	5,651,100	182,300	4,331,800	139,700	4,510,800	145,500	5,065,400	163,400
June	5,460,700	182,000	4,289,800	143,000	3,840,900	128,000	4,830,300	161,000
July	4,683,300	151,100	4,392,500	141,700	3,594,200	115,900	4,550,700	146,800
August	4,234,300	136,600	4,549,900	146,800	3,741,300	120,700	4,279,900	138,100
September	4,200,100	140,000	4,631,400	154,400	3,743,200	124,800	4,236,200	141,200
October	4,415,300	142,400	4,944,800	159,500	3,914,800	126,300	4,473,200	144,300
November	5,078,700	169,300	4,897,300	163,200	3,888,500	129,600	4,366,600	145,600
December	5,620,900	181,300	5,169,400	166,800	4,091,800	132,000	4,621,800	149,100
Total	61,806,100	169,300	51,711,200	141,700	51,910,300	142,200	54,278,300	148,700

[1]Daily average calculated by dividing monthly production by number of days in month.

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436,000 tons in September to 503,000 tons in December, while furnace-plant production varied from 3.5 million tons in February to 4.5 million tons in May. The average daily output for the year at merchant plants was 15,400 tons and at furnace plants, 130,600, increases of 3 percent and 4 percent, respectively, over that of 1962.

TABLE 6.—Production of oven coke in the United States, by type of plant

(Short tons)

Month	1957-59 (average)		1961		1962		1963	
	Merchant plants	Furnace plants	Merchant plants	Furnace plants	Merchant plants	Furnace plants	Merchant plants	Furnace plants
Production:								
January	705,700	4,924,300	467,400	3,027,000	512,600	4,760,800	488,400	3,756,200
February	641,100	4,518,300	425,100	2,872,700	490,300	4,376,600	455,700	3,498,100
March	681,400	5,063,300	463,400	3,191,900	523,500	4,630,600	497,900	4,129,600
April	612,900	4,765,400	469,600	3,329,100	485,200	4,441,100	483,100	4,257,200
May	609,800	4,922,600	474,200	3,776,900	454,400	3,997,400	478,400	4,485,000
June	575,800	4,777,000	455,400	3,755,900	405,700	3,381,100	468,500	4,265,600
July	569,100	4,034,200	416,500	3,903,700	378,000	3,172,400	436,800	4,029,700
August	573,200	3,578,500	425,100	4,040,600	415,100	3,275,800	451,300	3,749,100
September	572,900	3,548,600	436,500	4,121,900	412,200	3,279,100	435,600	3,721,600
October	586,000	3,754,000	465,600	4,398,200	433,600	3,417,300	475,600	3,915,000
November	582,700	4,419,900	475,600	4,346,700	444,300	3,378,300	452,600	3,836,400
December	649,000	4,886,200	515,600	4,575,800	483,500	3,549,500	502,800	4,037,400
Total	7,359,600	53,192,300	5,490,000	45,340,400	5,438,400	45,660,000	5,626,700	47,680,900
Daily average:								
January	22,800	158,800	15,100	97,600	16,500	153,600	15,700	121,200
February	22,900	161,400	15,200	102,600	17,500	156,300	16,300	124,900
March	22,000	163,300	14,900	103,000	16,900	149,400	16,100	133,200
April	20,400	158,900	15,600	111,000	16,200	148,000	16,100	141,900
May	19,700	158,800	15,300	121,800	14,700	128,900	15,400	144,700
June	19,200	159,200	15,200	125,200	13,500	112,700	15,600	142,200
July	18,400	130,100	13,500	125,900	12,200	102,300	14,100	130,000
August	18,500	115,400	13,700	130,400	13,400	105,700	14,600	120,900
September	19,100	118,300	14,600	137,400	13,800	109,300	14,500	124,100
October	18,900	121,100	15,000	141,900	14,000	110,200	15,300	126,300
November	19,400	147,400	15,800	144,900	14,800	112,600	15,100	127,900
December	20,900	157,600	16,700	147,600	15,600	114,500	16,200	130,300
Average for year	20,200	145,700	15,100	124,200	14,900	125,100	15,400	130,600

TABLE 7.—Production of oven coke and number of plants in the United States, by type of plant

Year	Number of active plants [1]		Coke produced (short tons)		Percent of production	
	Merchant plants	Furnace plants	Merchant plants	Furnace plants	Merchant plants	Furnace plants
1929	41	46	12,187,439	41,224,387	22.8	77.2
1939	39	45	11,070,506	31,811,807	25.8	74.2
1949	31	55	12,112,922	48,109,559	20.1	79.9
1957-59 (average)	[2] 21	[2] 54	7,359,600	53,192,300	12.2	87.8
1960	19	53	6,364,540	49,854,568	11.3	88.7
1961	18	52	5,490,047	45,340,362	10.8	89.2
1962	17	49	5,438,368	45,660,052	10.6	89.4
1963	17	47	5,626,701	47,680,908	10.6	89.4

[1] Includes plants operating any part of year.
[2] Dec. 31, 1959.

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PRODUCTION BY STATES

Statistics on production of oven and beehive coke in 1963 and for several prior years, by States, are presented in table 8. There was little change in the decade 1954–63 in number of producing States, but there were slight shifts in rank of States in order of coke output. In 1963, Pennsylvania produced more than twice as much oven coke as its nearest competitor, Indiana, but lost its number-one rank in beehive production for the first time on record to Virginia. Indiana, which supplanted Ohio's position in coke production in 1961, continued its position as the second-ranking coke-producing State. The permanent retirement of the coke ovens at the Lorain works of the U.S. Steel Corp. early in 1963 was a factor in the 7-percent decrease in coke output in Ohio.

Although oven coke was produced in 20 widely-scattered States ranging from Connecticut and New York on the east coast through the Midwest (Illinois and Missouri), Southwest (Texas), Rocky Mountains (Utah and Colorado), to the west coast (California), the bulk of coke output was produced in the large iron- and steel-producing districts of western Pennsylvania, the Ohio Valley, Detroit, Cleveland, Chicago, and Birmingham.

Five States east of the Mississippi River (Alabama, Indiana, Michigan, Ohio, and Pennsylvania) produced 69 percent of the total oven-coke output. Other States east of the Mississippi River produced 24 percent, and the balance or remaining 7 percent was produced in California, Colorado, Minnesota, Missouri, Texas, and Utah.

TABLE 8.—Production of coke in the United States, by States

(Short tons)

State	1957–59 (average)	1960	1961	1962	1963
Oven coke:					
Alabama	5,024,645	4,897,286	3,949,927	4,109,628	4,281,587
California, Colorado, Utah	2,701,547	2,840,131	3,017,217	2,406,276	2,408,363
Connecticut, Maryland, New Jersey, New York	[1] 7,821,854	[1] 7,071,167	6,234,321	6,499,514	6,354,716
Illinois	2,291,276	1,971,107	1,841,273	1,917,391	1,871,204
Indiana	8,148,294	8,024,273	7,666,870	7,027,014	7,541,430
Kentucky, Missouri, Tennessee, Texas	2,097,415	1,972,816	1,730,069	1,772,084	2,010,349
Michigan	3,166,295	3,278,739	2,958,342	3,164,917	3,460,027
Minnesota and Wisconsin	1,058,305	836,072	713,769	757,032	786,923
Ohio	8,871,503	8,423,246	6,703,475	6,848,812	6,339,546
Pennsylvania	15,935,874	14,146,269	13,320,866	13,985,742	15,245,046
West Virginia	3,434,892	2,758,002	2,694,280	2,610,010	3,008,418
Total	60,551,900	56,219,108	50,830,409	51,098,420	53,307,609
Beehive coke:					
Pennsylvania	895,358	684,250	453,989	384,839	383,979
Kentucky, Virginia, West Virginia	[2] 358,874	[3] 325,360	426,789	427,033	[4] 586,719
Total	1,254,232	1,009,610	880,778	811,872	970,698
Grand total	61,806,132	57,228,718	51,711,187	51,910,292	54,278,307

[1] Includes Massachusetts.
[2] Includes Utah.
[3] Excludes Kentucky.
[4] Excludes West Virginia.

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SCREENINGS OR BREEZE

The screening of the run-of-oven coke is a universal practice at oven-coke plants. The small coke which drops through ½-inch or, in some cases, ⅝-inch screens is called screenings or breeze. This material, which generally has a higher ash and moisture content than the larger sizes from which it is separated, has become an important industrial fuel. Increasing quantities are utilized in iron-ore sintering and in chemical-processing plants, particularly those producing elemental phosphorus and calcium carbide. Roughly 5 percent of the dry weight of coal carbonized in slot ovens is recovered as coke screenings or breeze. Since 1930, the yield of coke breeze has ranged between 6.86 and 4.59 percent and averaged 4.72 percent in 1963. The recovery of breeze is less widely practiced at beehive-coke plants, and only about one-half of the active plants recovered this material in 1963. At most of the beehive-coke plants, breeze is considered a waste material and is hauled away from the plant and deposited in waste banks or ash dumps. However, at beehive plants actually recovering this fuel, a yield of 6.38 percent was achieved in 1963.

Roughly, two-thirds of the breeze recovered at oven-coke plants is used by the producing companies on or near the premises. There has been, however, a significant change in the use of this fuel. Until the early 1950's, the bulk of the breeze used by producing companies was utilized in steam plants and the balance for miscellaneous heating purposes. In the past decade, the expansion of iron-ore agglomerating facilities at blast-furnace operations has increased tremendously coke-breeze requirements, and in 1963 almost one-half of the total production at oven-coke plants was used by the producing companies in sintering operations and only about one-sixth was used for steam raising. In addition, about 10 percent of the output is used by producing companies for miscellaneous purposes around steel works; for example, for lining ingot moulds, carbon runners on pig-iron laddles, soaking pits, and as a carburizing agent in steel furnaces.

Sales of breeze in 1963 increased 21 percent over that of 1962, but the average price per ton decreased 7 percent. The largest market for breeze is in the manufacture of elemental phosphorus from smelting phosphate rock. Approximately 1.5 tons of coke breeze is required to produce 1 ton of elemental phosphorus, and on this basis it is estimated that 700,000 tons of coke breeze was charged in electric furnaces to smelt phosphate rock. Other uses for breeze are in mineral-wool production, as aggregate in cement burial-vault manufacture, and for other industrial applications. The average price, f.o.b. plant, on coke breeze dropped for the second consecutive year from the record high of 1961. Table 9 shows production and disposal of coke breeze by States in 1963. Table 10 shows the quantities of breeze used by the producers according to major uses, the quantities sold, and the average value per ton for 1963 and selected prior years.

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TABLE 9.—Breeze recovered at coke plants in the United States in 1963, by States

State	Yield per ton of coal [1] (percent)	Produced		Used by producers—						Sold		On hand Dec. 31 (short tons)
		Short tons	Value	In steam plants		In agglomerating plants		For other industrial uses		Short tons	Value	
				Short tons	Value	Short tons	Value	Short tons	Value			
Oven coke:												
Alabama	5.78	340,884	$3,336,972	(2)	(2)	104,964	$1,122,938	30,773	$273,662	158,637	$1,546,238	73,969
California, Colorado, Utah	5.95	228,820	1,677,200	----------	----------	171,579	1,141,772	26,476	171,739	26,804	331,095	16,350
Connecticut, Maryland, New Jersey, New York	5.03	460,143	2,726,003	304,852	$1,833,779	(2)	(2)	92,711	514,571	(2)	(2)	76,321
Illinois	6.12	169,502	1,191,215	17,670	115,774	108,102	725,188	15,276	120,697	24,210	197,971	27,543
Indiana	5.57	603,200	3,851,152	50,832	308,791	503,608	3,293,879	42,259	272,839	84,463	417,056	590,503
Kentucky, Missouri, Tennessee, Texas	6.23	176,712	1,406,617	(2)	(2)	(2)	(2)	(2)	(2)	114,842	978,157	20,808
Michigan	4.38	207,636	1,417,529	(2)	(2)	(2)	(2)	(2)	(2)	110,109	740,516	10,947
Minnesota and Wisconsin	6.26	61,271	431,782	(2)	(2)	----------	----------	(2)	(2)	24,363	187,107	75,213
Ohio	4.46	405,750	2,583,443	66,561	429,716	41,258	263,577	80,061	449,764	236,446	1,607,772	119,056
Pennsylvania	3.38	739,536	5,184,314	119,104	876,043	545,718	3,935,728	45,911	307,361	127,006	687,658	121,614
West Virginia	4.84	215,352	1,301,074	(2)	(2)	(2)	(2)	30,365	186,110	(2)	(2)	1,318
Undistributed	----------	----------	----------	50,499	283,250	319,337	2,070,385	24,667	158,298	47,343	316,722	----------
Total 1963	4.72	3,608,806	25,107,301	609,518	3,847,353	1,794,566	12,553,467	388,499	2,455,041	954,223	7,000,292	[3] 1,133,642
At merchant plants	6.43	509,192	4,101,357	143,356	1,095,800	----------	----------	17,744	115,654	380,806	2,954,718	132,977
At furnace plants	4.52	3,099,614	21,005,944	466,162	2,751,553	1,794,566	12,553,467	370,755	2,339,387	573,417	4,045,574	1,000,665
Total 1962	4.67	3,424,720	23,781,913	720,466	4,555,341	1,471,530	10,019,160	594,997	4,112,505	772,623	6,073,502	[3] 1,279,641
Beehive coke:												
Pennsylvania	8.42	19,498	32,569	----------	----------	----------	----------	----------	----------	19,498	32,569	----------
Kentucky and Virginia	4.35	10,108	28,296	----------	----------	----------	----------	----------	----------	10,708	29,441	80
Total:												
1963	6.38	29,606	60,865	----------	----------	----------	----------	----------	----------	30,206	62,010	80
1962	5.95	43,433	218,570	----------	----------	----------	----------	----------	----------	43,733	219,324	300

[1] Calculated by dividing production by coal carbonized at plants actually recovering breeze.
[2] Included with "Undistributed" to avoid disclosing individual company data.
[3] Includes some breeze resulting from the screening of coke at blast furnaces.

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TABLE 10.—Oven- and beehive-coke breeze used and sold in the United States, by uses

(Short tons)

Year	Used by producers—			Sold	Average value per ton
	In steam plants	In agglomerating plants	For other industrial use		
1947–49 (average)	3,450,905	[1] 300,000	[2] 489,055	1,142,589	$3.79
1957–59 (average)	1,612,547	796,390	447,171	1,042,308	7.22
1960	1,142,730	1,343,515	479,740	972,240	8.27
1961	619,458	1,518,930	506,746	807,798	8.30
1962	720,466	1,471,530	594,997	816,356	7.71
1963	609,518	1,794,566	388,499	984,429	7.17

[1] Estimated.
[2] Includes 77,795 tons used to make producer or water gas.

DISPOSAL

CONSUMPTION AND SALES

The apparent consumption of coke in the United States in 1963, allowing for imports, exports, and changes in producers' stocks, increased 6 percent over that of 1962 but was 9 percent below the 1957–59 period and 30 percent less than the record established in 1951. A number of economic and technologic factors have been responsible for the large drop in coke consumption. Most of the decline, however, may be attributed to two factors—the substitution of other fuels (fuel oil and natural gas) for coke, and lower blast-furnace coke rates. For example, 8 million tons of coke was used for manufacturing producer and water gas and for residential heating in the 1947–49 period compared with only 592,000 tons in 1963. Because of the losses of these markets, only 11 percent of the apparent coke consumption in the United States in 1963 was used for purposes other than the smelting of iron ore in blast furnaces.

In the past decade, blast furnaces have consistently used nearly 90 percent of the coke consumed. For this reason, changes in coke rates are important. In 1963, the amount of coke consumed per ton of pig iron and ferroalloys produced in blast furnaces dropped to 1,350.5 pounds. This decrease (3 percent from 1962 and 17 percent from the 1957–59 average) was attributed mainly to improved burdens (coke and iron ore) and advanced operating techniques such as higher blast temperatures, fuel injection, and oxygen enrichment of the blast. The coke rate between 1953 and 1963 dropped 484.4 pounds, and further improvements in blast-furnace fuel efficiency may be expected in the future. The steady decline in coke rates directly affected coal and coke operations, as blast-furnace coke requirements in 1963 were 17.5 million tons lower (equivalent to 25 million tons of bituminous coal) than would have been consumed if furnaces were operating on 1953 coke rates.

Tables 13 and 14 summarize, by major end use, the disposal of oven and beehive coke in 1963. Furnace oven-coke producers use the bulk of their coke in integrated and affiliated blast furnaces, whereas merchant oven-coke producers and beehive-coke producers sell most of their output to blast-furnace installations, foundries,

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and to miscellaneous other industrial organizations. Only a small fraction of the coke production, largely by merchant oven-coke producers, is marketed for residential heating, as combined sales from furnace oven-coke plants and beehive plants amounted to less than 10,000 tons. In 1963, furnace oven-coke producers used and sold 48,058,029 tons, of which 97 percent was used in company-operated blast furnaces, 1 percent was used for various other purposes, and only 2 percent was marketed or could be considered merchant sales. The distribution pattern was quite different with merchant oven-coke producers, as they sold 94 percent and used only 6 percent of the total disposal. Most of the blast-furnace installations without coke-supporting facilities, as well as gray-iron foundries, nonferrous smelters, and chemical companies that use coke as a raw material, are supplied by merchant oven-coke producers. In 1963, merchant producers of oven coke sold 5,726,283 tons which was distributed as follows: 37 percent was sold to blast-furnace operators; 40 percent to iron foundries; 14 percent for other industrial purposes; and 9 percent was sold for residential heating.

TABLE 11.—Apparent consumption of coke in the United States

(Short tons)

Year	Total production	Imports	Exports	Net change in stocks	Apparent U.S. consumption [1]	Consumption			
						In iron furnaces [2]		All other purposes	
						Quantity	Percent	Quantity	Percent
1937–39 (average)	43,065,975	187,838	534,393	+290,011	42,429,409	28,009,630	66.0	14,419,779	34.0
1947–49 (average)	70,648,402	181,000	696,699	+280,230	69,852,473	55,877,463	80.0	13,975,010	20.0
1957–59 (average)	61,806,132	120,908	558,428	+782,665	60,585,947	54,140,391	89.4	6,445,556	10.6
1960	57,228,718	126,345	353,016	+55,652	56,946,395	51,044,206	89.6	5,902,189	10.4
1961	51,711,187	126,518	445,232	−696,215	52,088,688	46,771,105	89.8	5,317,583	10.2
1962	51,910,292	141,883	[3]364,032	−135,062	[3]51,823,205	46,244,675	[3]89.2	[3]5,578,530	[3]10.8
1963	54,278,307	152,595	451,241	−1,021,880	55,001,541	48,871,568	88.9	6,129,973	11.1

[1] Production plus imports minus exports, plus or minus net change in stocks.
[2] American Iron and Steel Institute; figures include coke consumed in manufacturing ferroalloys.
[3] Revised figure.

TABLE 12.—Coke and coking coal consumed per short ton of pig iron and ferroalloys produced in the United States

Year	Coke per short ton of pig iron and ferroalloys [1] (pounds)	Yield of coke from coal (percent)	Coking coal per short ton of pig iron and ferroalloys (pounds calculated)	Year	Coke per short ton of pig iron and ferroalloys [1] (pounds)	Yield of coke from coal (percent)	Coking coal per short ton of pig iron and ferroalloys (pounds calculated)
1913	2,172.6	66.9	3,247.5	1957–59 (average)	1,634.4	70.0	2,334.9
1918	2,120.7	66.4	3,193.8	1960	1,516.4	70.3	2,157.0
1929	1,838.0	69.0	2,663.8	1961	1,432.6	69.7	2,055.4
1939	1,778.0	69.8	2,547.3	1962	1,395.2	69.5	2,007.5
1949	1,895.8	69.6	2,723.9	1963	1,350.5	69.5	1,943.2

[1] American Iron and Steel Institute: consumption per ton of pig iron only, excluding furnaces making ferroalloys, was 2,172.6 pounds in 1913, 2,120.7 in 1918, 1,813.3 in 1929, 1,760.0 in 1939, 1,870.4 in 1949, 1,617.0 in 1957–59 (average), 1,497.4 in 1960, 1,415.0 in 1961, 1,379.0 in 1962, and 1,338.1 in 1963.

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TABLE 13.—Oven coke produced in the United States, used by producers, and sold in 1963, by States

State	Produced		Used by producing companies—				Commercial sales—	
			In blast furnaces		For other purposes [1]		To blast-furnace plants	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	4,281,587	$88,209,688	3,380,387	$65,188,408	148,920	$4,116,855	(2)	(2)
California, Colorado, Utah	2,408,363	58,151,574	2,417,317	58,738,695	28,770	631,605		
Connecticut, Maryland, New Jersey, New York	6,354,716	104,478,953	5,477,064	87,378,272	75,273	1,336,055	331,020	$5,840,851
Illinois	1,871,204	35,440,208	1,765,597	32,451,522	80,140	2,620,163		
Indiana	7,541,430	145,818,862	7,212,717	137,231,906	15,651	289,467	(2)	(2)
Kentucky, Missouri, Tennessee, Texas	2,010,349	35,952,841	680,754	12,982,065	11,712	225,344	(2)	(2)
Michigan	3,460,027	62,839,859	(2)	(2)	173,997	2,978,934	79,158	1,426,343
Minnesota and Wisconsin	786,923	17,717,594	(2)	(2)	(2)	(2)	(2)	(2)
Ohio	6,339,546	111,068,683	5,377,084	90,796,969	146,042	3,040,729	(2)	(2)
Pennsylvania	15,245,046	227,269,368	14,615,093	215,639,605	25,242	396,225	193,535	3,028,923
West Virginia	3,008,418	50,014,557	2,913,594	48,812,665	(2)	(2)	(2)	(2)
Undistributed			3,039,862	50,492,408	2,279	41,683	1,675,721	24,800,685
Total 1963	53,307,609	936,962,187	46,879,469	799,712,515	708,026	15,677,060	2,279,434	35,096,802
At merchant plants	5,626,701	121,421,865			396,380	8,323,590	2,099,782	32,235,828
At furnace plants	47,680,908	815,540,322	46,879,469	799,712,515	311,646	7,353,470	179,652	2,860,974
Total 1962	51,098,420	927,064,568	44,350,270	782,227,676	658,938	15,198,318	2,274,779	36,357,938

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Commercial sales—Continued

	To foundries		To other industrial plants [3]		For residential heating		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Alabama	501,415	$14,459,450	246,764	$4,339,374	(2)	(2)	843,487	$20,178,941
California, Colorado, Utah	(2)	(2)	(2)	(2)			42,006	881,130
Connecticut, Maryland, New Jersey, New York	258,357	7,830,310	244,161	3,753,033	311,971	$4,942,713	1,145,509	22,366,907
Illinois			7,747	104,238	2,178	35,252	9,925	139,490
Indiana	(2)	(2)	121,514	2,026,813	(2)	(2)	642,178	15,009,042
Kentucky, Missouri, Tennessee, Texas	(2)	(2)	56,439	942,149	(2)	(2)	1,293,926	22,275,282
Michigan	(2)	(2)	169,205	2,519,639	(2)	(2)	610,688	15,276,073
Minnesota and Wisconsin	(2)	(2)	76,649	1,419,749	(2)	(2)	432,787	12,298,971
Ohio	319,817	9,560,291	123,953	1,793,493	(2)	(2)	840,691	17,471,412
Pennsylvania	181,048	5,485,655	157,111	1,908,558	126,080	1,766,685	657,774	12,189,821
West Virginia			(2)	(2)			74,226	917,352
Undistributed	1,250,546	38,563,769	83,194	1,325,808	75,614	1,130,640		
Total 1963	2,511,183	75,899,475	1,286,737	20,132,854	515,843	7,875,290	6,593,197	139,004,421
At merchant plants	2,294,025	69,421,477	821,969	13,609,198	510,507	7,791,555	5,726,283	123,058,058
At furnace plants	217,158	6,477,998	464,768	6,523,656	5,336	83,735	866,914	15,946,363
Total 1962	2,296,165	69,469,710	1,186,457	19,419,908	459,099	6,474,060	6,216,500	131,721,616

[1] Comprises 227,854 tons valued at $6,907,255 used in foundries; 50,100 tons valued at $986,357 to make producer and water gas; and 430,072 tons valued at $7,783,448 for other purposes.

[2] Included with "Undistributed" to avoid disclosing individual company data.

[3] Includes 24,769 tons valued at $491,480 to water-gas plants.

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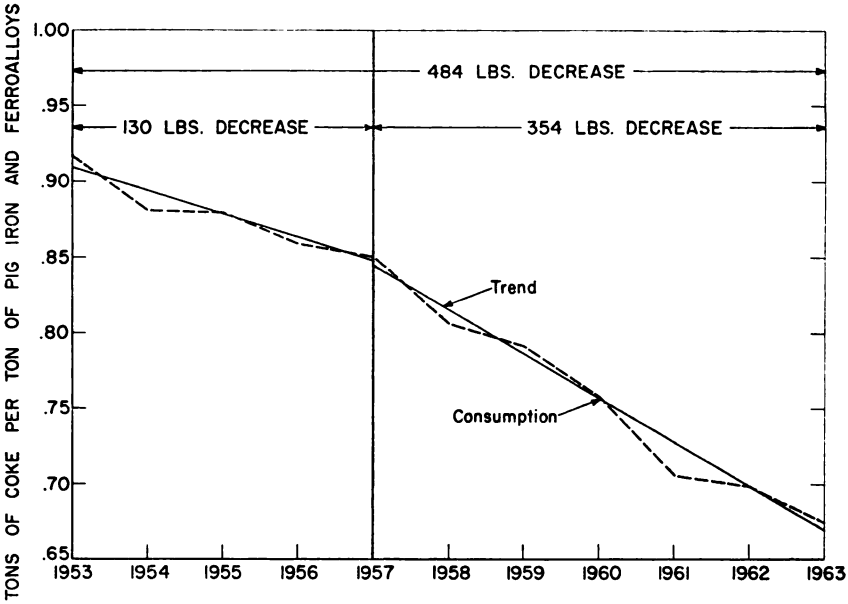

FIGURE 3.—Coke consumption per short ton of pig iron and ferroalloys produced in blast furnaces in the United States.

TABLE 14.—Beehive coke produced in the United States, used by producers, and sold in 1963, by States

State	Produced		Used by producing companies—				Commercial sales—	
			In blast furnaces		For other purposes		To blast-furnace plants	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Pennsylvania	383,979	$5,371,354	(1)	(1)	-------	-------	302,607	$4,492,886
Kentucky, Virginia, West Virginia	586,719	9,558,302	-------	-------	-------	-------	140,333	2,001,045
Total:								
1963	970,698	14,929,656	(1)	(1)	-------	-------	442,940	6,493,931
1962	811,872	12,146,630	(1)	(1)	(2)	(2)	268,986	3,982,031

State	Commercial sales—Continued							
	To foundries		To other industrial plants		For residential heating		Total	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Pennsylvania	(1)	(1)	78,909	$841,962	(2)	(2)	381,516	$5,334,848
Kentucky, Virginia, West Virginia	(1)	(1)	447,577	7,568,050	(2)	(2)	587,910	9,569,095
Total:								
1963	(1)	(1)	526,486	8,410,012	(2)	(2)	969,426	14,903,943
1962	7,551	$106,826	538,401	8,100,469	(2)	(2)	814,938	12,189,326

[1] Combined with coke sold "to blast-furnace plants" to avoid disclosing individual company data.
[2] Combined with coke sold "to other industrial plants" to avoid disclosing individual company data.

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In recent years there has been a marked change in the distribution pattern of beehive coke. Until the late 1950's, virtually all of the beehive coke was produced for use as blast-furnace fuel. Some blast-furnace installations, which depended on beehive coke when operations were at a high level, were made self-sufficient by the sharp decline in coke rates. However, the increase in requirements of "chemical coke" or coke used in the production of elemental phosphorus and calcium carbide has resulted in the shipment of beehive coke to such plants. Thus in 1963, 54 percent of the beehive-coke production was distributed for various industrial purposes and only 46 percent went to blast-furnace plants.

GEOGRAPHIC DISTRIBUTION

The distribution of oven and beehive coke and breeze by major end use and final destination is shown in table 15. Total distribution of coke, exclusive of imports, was 6 percent higher than in 1962 but 30 percent below the record established in 1951. The increase over 1962 was due largely to the 2.7-million-ton gain in shipments to blast-furnace plants, although shipments to foundries, to other industrial plants, and for residential heating also increased. The only coke-consuming industry that received less coke in 1963 than in 1962 was the gas industry.

Blast-furnace coke was shipped to approximately 80 plants in 16 States in 1963 with Pennsylvania, Indiana, and Ohio consuming more than one-half of the total. Other States that consumed more than 3 million tons of blast-furnace coke each were Michigan, Alabama, and Illinois which, combined, consumed more than one-fifth of the total. Usually, blast-furnace coke is not shipped long distances because most of the blast-furnace installations are integrated with coke ovens.

Unlike blast-furnace coke, which moves short distances in large volumes to a limited number of installations in a small number of States, movement of foundry coke is widespread. In addition, the number of individual foundry installations using coke is in the thousands. The principal foundry-coke consuming States were Michigan, Ohio, Illinois, and Alabama, which together used more than one-half of the total distribution of foundry coke. The increase in foundry-coke consumption in 1963 was general, as virtually all States showed increases when compared with 1962.

For many years, the Bureau of Mines has grouped the coke used for miscellaneous industrial purposes in one classification designated as "other industrial." Shipments in this category were 4 percent of the total and included all coke shipped to industrial plants other than blast furnaces, iron and steel foundries, and gas plants.

Shipments to gas plants continued to decline in 1963 whereas the downward trend in shipments of coke for residential heating was temporarily halted because of an increase in exports of such coke. This gain was due to shipments of coke to the Armed Forces of the United States stationed in western Europe for space-heating purposes.

The distribution of coke screenings or breeze increased 5 percent over 1962. The major part of the breeze distributed was consumed by the producing companies for sintering iron ore, raising steam, and

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various other purposes. The principal breeze-consuming States were Pennsylvania, Indiana, and Ohio, which together utilized almost one-half of the total breeze distributed in 1963.

TABLE 15.—Distribution of oven and beehive coke and breeze in 1963 [1]

(Short tons)

Consuming State	Coke						Breeze
	To blast-furnace plants	To foundries	To producer-and water-gas plants	To other industrial plants	For residential heating	Total	
Alabama	3,390,677	203,214		83,778	11,231	3,688,900	240,967
Arizona		1,935				1,935	39
Arkansas		1,234		3,833		5,067	
California	988,152	55,366		43,816		1,087,334	86,524
Colorado	555,024	12,822		33,109		600,955	57,008
Connecticut		25,153	53,018	1,227	14,805	94,203	44,142
Delaware				2,862		2,862	1,215
District of Columbia		980		1,086		2,066	269
Florida		4,074		41,121	174	45,369	28,455
Georgia		11,811		3,512	3,440	18,763	1,593
Idaho		74		113,929		114,003	24,748
Illinois	3,323,397	229,760		111,912	6,789	3,671,858	191,332
Indiana	6,606,461	132,684	1,463	74,344	11,943	6,826,895	600,084
Iowa		74,512		6,328	514	81,354	4,696
Kansas		9,045				9,045	1,635
Kentucky	540,528	45,041		185,641	13,875	785,085	54,378
Louisiana		2,744		59,049	61	61,854	899
Maine		956	19,483			20,439	
Maryland	2,990,035	22,652		10,323		3,023,010	159,989
Massachusetts		38,697		881	43,743	83,321	
Michigan	3,778,620	652,438		220,687	5,997	4,657,742	235,807
Minnesota	360,133	20,504		17,668	2,499	400,804	23,186
Mississippi		1,130		42		1,172	53
Missouri		21,385		58,659		80,044	592
Montana		1,826		13,747		15,573	41,210
Nebraska		3,390		8,847		12,237	82
Nevada							
New Hampshire		1,635		18		1,653	
New Jersey		94,113		77,447	60,105	231,665	49,580
New Mexico				65	124	189	
New York	2,808,448	109,470		97,043	12,966	3,027,927	189,486
North Carolina		19,101		21,091	971	41,163	14,046
North Dakota		271		29		300	31
Ohio	8,471,649	356,900		265,636	3,923	9,098,108	409,531
Oklahoma		4,135		1,485		5,620	2,921
Oregon		4,503		16,565		21,068	2,600
Pennsylvania	12,621,583	123,950	905	149,469	17,439	12,913,346	783,359
Rhode Island		9,338		461		9,799	
South Carolina		9,496		11,860	495	21,851	7,864
South Dakota		575		1,148		1,723	
Tennessee	83,633	84,099		193,427	4,012	365,171	142,072
Texas	650,478	66,636		35,099	1,350	753,563	80,276
Utah	874,141	16,230		32,332		922,703	59,357
Vermont		2,834		38	507	3,379	
Virginia		53,755		29,235	151	83,141	578
Washington		3,605		7,173	39	10,817	446
West Virginia	1,471,155	7,929		43,325		1,522,409	226,078
Wisconsin		130,027		1,423	8,841	140,291	7,764
Wyoming				4,532		4,532	70
Total	49,514,114	2,672,029	74,869	2,085,302	225,994	54,572,308	3,774,962
Exported	69,052	85,662		131,788	291,308	577,810	2,050
Grand total	49,583,166	2,757,691	74,869	2,217,090	517,302	55,150,118	3,777,012

[1] Based upon reports from producers showing destination and principal end use of coke used and sold. Does not include imported coke, which totaled 152,595 tons in 1963.

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STOCKS OF COKE AND BREEZE

Stocks of coke at oven- and beehive-coke plants on December 31, 1963, are given in table 16. Stocks of oven coke at merchant and furnace plants are shown by months in table 17. For the third consecutive year, producers' stocks of oven coke decreased, dropping 26 percent during 1963. The total decrease of more than one million tons was almost equally divided between the merchant and furnace groups with the latter recording a slightly larger decrease in volume. In terms of percentage, however, the merchant group had the largest decrease, cutting their 1962 inventory nearly one-half by December 31, 1963.

Furnace plants finished the year with about 5 times as much coke as merchant plants, but when measured in terms of days' production totaled only 18 days compared with an equivalent of 30 days' production for the merchant group. Most of the stocks of oven coke was blast-furnace grade which accounted for 83 percent of the total. The largest stocks of furnace-grade coke was at furnace oven-coke plants whereas the merchant group of plants had the largest reserves of foundry grade and other grades of coke.

Stocks of beehive coke varied only slightly from the preceding year and were insignificant. Stocks of coke screenings or breeze decreased slightly during 1963. However, more than one-half of the breeze stocks were held by the producing companies in Indiana.

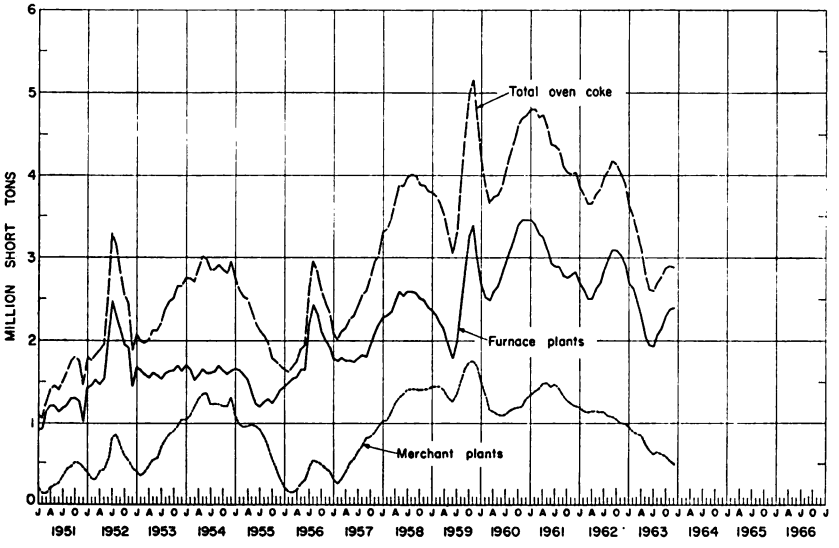

FIGURE 4.—Producers' stocks of oven coke in the United States, by months.

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TABLE 16.—Producers' stocks of coke and breeze in the United States on Dec. 31, 1963, by States

(Short tons)

State	Coke				Breeze
	Blast furnace	Foundry	Residential heating and other	Total	
Oven coke:					
Alabama	532,018	11,185	100,542	643,745	73,969
California, Colorado, Utah	212,244	----------	----------	212,244	16,350
Connecticut, Maryland, New Jersey, New York	258,875	38,804	50,342	348,021	76,321
Illinois	72,117	----------	5,709	77,826	27,543
Indiana	424,948	5,855	1,090	431,893	590,503
Kentucky, Missouri, Tennessee, Texas	168,212	28,084	17,011	213,307	20,808
Michigan	36,943	2,183	10,664	49,790	10,947
Minnesota and Wisconsin	72,192	36,894	84,380	193,466	75,213
Ohio	156,417	9,922	39,095	205,434	119,056
Pennsylvania	420,812	6,483	39,595	466,890	121,614
West Virginia	36,205	----------	----------	36,205	1,318
Total 1963	2,390,983	139,410	348,428	2,878,821	1,133,642
At merchant plants	93,207	122,366	269,119	484,692	132,977
At furnace plants	2,297,776	17,044	79,309	2,394,129	1,000,665
Total 1962	3,230,552	174,771	495,267	3,900,590	1,279,641
Beehive coke:					
Pennsylvania	4,834	----------	341	5,175	----------
Kentucky and Virginia	----------	----------	935	935	80
Total:					
1963	4,834	----------	1,276	6,110	80
1962	4,722	----------	1,499	6,221	300

TABLE 17.—Producers' month-end stocks of oven coke in the United States

(Short tons)

Month	At merchant plants		At furnace plants		Total	
	1962	1963	1962	1963	1962	1963
January	1,180,978	937,903	2,679,384	2,688,158	3,860,362	3,626,061
February	1,146,966	871,464	2,614,123	2,620,780	3,761,089	3,492,244
March	1,136,362	845,617	2,500,942	2,472,069	3,637,304	3,317,686
April	1,144,066	829,026	2,506,864	2,280,177	3,650,930	3,109,203
May	1,150,499	732,717	2,624,386	2,047,941	3,774,885	2,780,658
June	1,134,772	660,119	2,700,008	1,947,240	3,834,780	2,607,359
July	1,140,736	663,048	2,837,601	1,932,980	3,978,337	2,596,028
August	1,093,800	638,097	2,971,251	2,070,619	4,065,051	2,708,716
September	1,079,400	610,767	3,094,416	2,166,067	4,173,816	2,776,834
October	1,047,404	570,464	3,083,879	2,300,830	4,131,283	2,871,294
November	994,500	523,270	3,024,258	2,375,864	4,018,758	2,899,134
December	980,654	484,692	2,919,936	2,394,129	3,900,590	2,878,821

VALUE AND PRICE

The average values and prices of oven and beehive coke produced and sold, as reported by the producing companies, are shown in tables 18 and 19. The average values at plants of oven and beehive coke produced (which includes coke consumed by producing companies as well as coke sold) are based on reports from the producing companies that showed receipts, f.o.b. plant, for commercial sales of coke and the prevailing market value assigned by the producers for coke consumed by the producing companies. The average value of oven

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and beehive coke produced in 1963 was the lowest since 1955. This decrease was due to the decrease in value of production assigned by the producers of oven coke as the average value of beehive coke was the highest on record. Since coke prices closely follow the delivered coal costs, the decrease in value of oven coke was due principally to the decrease in coal costs at oven-coke plants. The average receipts per ton of coke sold which are based on commercial sales only usually serve as good indicators of market conditions. The 1963 average receipts for oven coke decreased slightly from 1962 and was $1.02 higher than the 1957–59 average. On beehive coke, however, a firm market in the chemical industry resulted in an increase of $0.53 per ton for all behive-coke sales.

Data on the average receipts per ton of oven and beehive coke according to major end use are shown in table 19. Prices received by oven-coke producers on sales of blast-furnace coke, foundry coke, and coke for "other industrial" uses were lower than the 1962 averages, whereas prices on oven coke sold for residential heating increased. The large spread in prices between blast furnace and foundry is due to a number of factors such as lower yields of coke from coking-coal admixtures because of higher proportions of low-volatile coals, longer coking schedules which reduces productivity, and larger minimum sizes. However, the difference in prices of oven- and beehive-foundry coke is due largely to transportation charges on coal and/or coke.

TABLE 18.—Average value per short ton of coke produced in the United States and average receipts per short ton from coke sold (commercial sales)

Year	Value per ton produced			Receipts per ton sold		
	Oven coke	Beehive coke	Total	Oven coke	Beehive coke	Total
1957–59 (average)	$18.14	$14.70	$18.07	$20.06	$14.67	$19.29
1960	18.38	14.61	18.31	20.25	14.55	19.59
1961	17.80	15.08	17.76	21.14	15.13	20.55
1962	18.14	14.96	18.09	21.19	14.95	20.62
1963	17.58	15.38	17.54	21.08	15.48	20.53

TABLE 19.—Average receipts per short ton of coke sold (commercial sales) in the United States, by uses

Year	Oven coke				Beehive coke			
	To blast-furnace plants	To foundries	To other industrial plants [1]	For residential heating	To blast-furnace plants	To foundries	To other industrial plants [1]	For residential heating
1957–59 (average)	$15.85	$29.39	$15.87	$17.15	$14.84	$16.72	$14.04	$11.64
1960	15.82	30.29	16.27	17.25	15.02	15.76	13.79	14.39
1961	15.98	30.07	16.67	17.12	15.94	16.02	[2] 14.95	16.87
1962	15.98	30.25	16.37	14.10	14.35	14.15	15.05	15.63
1963	15.40	30.22	15.65	15.27	14.06	14.75	15.99	9.35

[1] Includes water-gas plants.
[2] Revised.

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FOREIGN TRADE

IMPORTS

For the sixth consecutive year coke imports increased and in 1963 rose 8 percent over that of 1962 and 26 percent above the 1957–59 average. The total quantity of coke imported was relatively small, however, and represented only about 1 day's production of oven coke. Although the quantity of coke imported was small when compared with annual consumption in the United States, it is extremely important to many industrial firms in certain areas, particularly in the northwest. The coke imported in this area originates in Canada and is used largely for nonferrous smelting and chemical processing.

As shown in table 20, 94 percent of the coke imports in 1963, as in preceding years, originated in Canada. The principal gateways for this coke are the Montana and Idaho, Michigan, Buffalo, and Washington customs districts. Imports entering the New Orleans customs district, most of which originated in Europe, nearly tripled in 1963. Although the quantity of coke that entered the United States through this district amounted to only 9,266 short tons valued at $298,725, it had a high average value of $32.24 per short ton. This high average value was due largely to imports from the Netherlands and West Germany and indicated that they probably were special-purpose carbons such as pitch coke. The Bureau of the Census data do not separate petroleum and pitch cokes from coal coke.

EXPORTS

Coke exports increased 24 percent in 1963 but were 19 percent below the average for 1957–59. The United States has always been a net exporter of coke, and shipments outside the continental United States since 1950 have ranged between 0.5 and 1.3 percent of the total output. In 1963, exports represented 1 percent of the year's production. Canada has always been the principal foreign market, and 76 percent of the total exports in 1963 were destined to that country. In addition to Canada, coke was exported to 24 other countries with Venezuela, Italy, Mexico, and Yugoslavia receiving the largest quantities.

Table 21 shows the quantities and countries of destination of coke exported for 1961–63. Also shown in this table are the customs districts from which the coke was exported. Although the Bureau of the Census data do not show the grades and sizes of coke exported, annual coke distribution reports submitted by coke-producing companies to the Bureau of Mines indicated that nearly all of the 1963 exports were industrial-size coke. Also, only coke made from coal is included in the Bureau of the Census data.

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Exports of coke to South America rose nearly threefold during 1963, mainly because of the substantial shipments to Venezuela. Presumably, this coke was used to smelt iron ore in the new iron and steel plant recently built in that country.

Shipments to Europe increased 78 percent, largely because of considerable tonnages destined to Italy, Yugoslavia, Portugal, and Norway. Coke was exported to Yugoslavia for the first time since 1952.

Exports to Asia increased 180 percent over those of 1962 but were 70 percent below those in 1961. Most of the shipments to Asia were destined to Japan, where it was used for miscellaneous industrial purposes. Only a few tons of coke was exported to Africa, and none was shipped to Oceania.

TABLE 20.—Coke imported for consumption in the United States, by countries and by customs districts

	1961		1962		1963	
	Short tons	Value	Short tons	Value	Short tons	Value
Country or area:						
North America:						
Canada	126,408	$1,539,486	132,076	$1,663,693	142,952	$1,731,011
Dominican Republic					5	419
Netherlands Antilles			73	787	100	1,071
Total	126,408	1,539,486	132,149	1,664,480	143,057	1,732,501
Europe:						
Belgium-Luxembourg	110	3,230	720	21,029	220	6,365
Germany, West			69	18,297	782	81,322
Netherlands					1,792	112,917
United Kingdom			8,939	151,361	6,744	113,942
Yugoslavia			6	173		
Total	110	3,230	9,734	190,860	9,538	314,546
Grand total	126,518	1,542,716	141,883	1,855,340	152,595	2,047,047
Customs District:						
Buffalo	1,468	11,422	2,264	20,023	20,896	144,132
Hawaii	110	3,230	759	22,413	220	6,365
Maine and New Hampshire	95	1,615	106	1,687	96	1,508
Maryland					100	1,071
Michigan	52,361	447,202	45,519	394,972	39,097	344,347
Minnesota	49	352	102	879		
Montana and Idaho	63,003	941,638	65,597	992,862	66,420	988,659
New Orleans			3,698	78,993	9,266	298,725
New York			79	960		
Puerto Rico					5	419
Sabine					52	9,456
St. Lawrence			304	9,491	363	11,830
San Francisco			547	4,626		
South Carolina			5,271	89,281		
Vermont	110	1,745	35	585	76	1,258
Washington	9,322	135,512	17,602	238,568	16,004	239,277
Total	126,518	1,542,716	141,883	1,855,340	152,595	2,047,047

Source: Bureau of the Census.

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TABLE 21.—Coke exported from the United States, by countries and by customs districts

	1961		1962		1963	
	Short tons	Value	Short tons	Value	Short tons	Value
Country or area:						
North America:						
Canada	343,445	$6,679,762	311,177	$6,052,007	344,456	$6,502,346
Mexico	7,691	218,958	9,878	267,297	13,633	331,863
Panama	45	2,002	306	9,131	584	10,532
West Indies:						
Trinidad and Tobago	116	2,522	113	2,573	59	1,299
Other West Indies	30	960	291	6,946	30	1,300
Other North America	80	2,293	220	5,205	38	1,671
Total	351,407	6,906,497	321,985	6,343,159	358,800	6,849,011
South America:						
Bolivia					131	2,360
Brazil	5,706	141,147	9,923	274,066	5,730	159,424
Chile	391	11,486	249	7,330	900	22,743
Colombia	156	3,555	251	4,983	98	2,025
Ecuador	148	2,897	175	3,289	243	5,682
Peru	10,224	186,196			74	3,138
Venezuela	37	884	263	7,833	24,879	265,603
Total	16,662	346,165	10,861	297,501	32,055	460,975
Europe:						
Belgium-Luxembourg	68	1,360				
Denmark			325	6,792		
Germany, West			[1] 14,862	[1] 167,686	446	5,700
Greece					131	1,160
Italy	32,964	412,080	15	396	15,233	201,336
Norway					7,388	96,712
Portugal			10,766	158,000	10,039	189,424
United Kingdom	214	4,100	424	8,330	632	10,146
Yugoslavia					13,100	136,900
Total	33,246	417,540	[1] 26,392	[1] 341,204	46,969	641,878
Asia:						
India	967	20,578	1,386	27,307	708	15,101
Iran					16	714
Japan	34,933	372,744	[1] 1,142	[1] 31,039	12,365	341,643
Korea, Republic of	7,146	125,797				
Philippines	871	23,250	2,190	80,358	300	7,699
Taiwan			61	899		
Total	43,917	542,369	[1] 4,779	[1] 139,603	13,389	365,157
Africa: Congo, Republic of the, and Ruandi-Urundi					28	986
Oceania: Australia			15	570		
Grand total	445,232	8,212,571	[1] 364,032	[1] 7,122,037	451,241	8,318,007
Customs District:						
Buffalo	104,501	2,046,371	69,242	1,514,987	88,627	1,905,554
Chicago	44,824	706,577	81,681	1,208,950	104,198	1,536,622
Dakota	9,410	231,360	8,308	248,334	7,431	234,470
Duluth and Superior	3,094	78,599	3,029	79,701	3,191	74,545
Laredo	6,224	187,831	8,908	240,493	12,152	293,974
Los Angeles	14,128	153,745				
Maryland	500	10,978	100	4,338		
Massachusetts	48,006	644,170	65	1,750		
Michigan	156,623	3,110,461	138,856	2,755,363	122,373	2,385,340
Mobile	701	19,239	11,245	170,735	1,204	31,035
Montana and Idaho					441	10,930
New Orleans	11,622	125,954	724	20,313	1,011	24,198
New York	11,746	248,565	9,243	266,340	42,034	505,322
Ohio	3,000	25,764	2,334	47,894	6,522	56,890
Oregon			1,136	30,939	12,290	339,780
Philadelphia	7,538	108,356	19,408	290,898	35,447	568,332
Sabine			551	9,250		
St. Lawrence	18,597	318,198	4,010	69,339	8,552	190,439
San Diego	794	23,315	858	22,151	1,332	32,544
Vermont	45	972	96	1,469	490	8,820
Virginia	116	2,522	113	2,573	59	1,299
Washington	3,443	113,320	3,787	129,075	3,295	102,912
Other districts	320	6,274	338	7,145	597	14,806
Total	445,232	8,212,571	[1] 364,032	[1] 7,122,037	451,241	8,318,007

[1] Revised figure.

Source: Bureau of the Census.

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WORLD PRODUCTION

World production of hard or metallurgical coke in 1963 reached an alltime record estimated at 313,236,000 short tons, an increase of 4 percent over that of 1962 and 2 percent higher than the previous maximum of 1960. The gain in coke output over that of 1962 was general, with advances made by each of the six continental groups. Europe, with a large number of highly-industrialized countries, produced 64 percent of the world's total. North America, due mainly to the United States contribution, ranked second, and Asia was third.

The largest gain by a major producing country was made by Japan where output increased 34 percent over that of 1962 and 117 percent over that in 1959. This remarkable development in coke production may be attributed to the rapid growth of the Japanese iron and steel industry. Blast-furnace coke requirements in Japan have increased rapidly, although the Japanese coke rates have declined and were as low as any other country in the world in 1963.

The Soviet Union continued to lead the world in coke production, as output increased 5 percent over the 1962 figure and was 20 percent above that of 1959. The quantity produced in this country amounted to 23 percent of the world total. This achievement may be attributed to the all-out effort to increase the productive capacity of heavy industry. As in other major coke-producing countries, the output of hard coke in Russia is geared to iron and steel production. Consequently, all of the new blast-furnace installations constructed since World War II also were provided with coke-supplying facilities.

Although the United States leads the world in total carbonizing capacity, only about 80 to 85 percent has been utilized since the late 1950's. Consequently, coke production in the United States trailed that in the Soviet Union. Also, the actual divergence in output was not as large as the data in table 22 indicate because the United States total excludes screenings or breeze, which is included in the Soviet Union's figure.

West Germany retained its rank as the third-ranking producer of the world. The Soviet Union, the United States, and West Germany may be called the "big three" as the combined output of these three countries amount to 55 percent of the world total. West Germany, however, was the only country of the "big three" where production declined in 1963. This decline was due mainly to reduced blast-furnace coke requirements resulting from improvements in fuel efficiency of the furnaces.

Other ranking coke-producing countries were the United Kingdom, Japan, China, Poland, and France, in the order named. Production trends in these countries differ, with Japan and Poland showing definite gains whereas production in the other countries was stabilized or declined slightly. Data for China, however, were merely guesses, because little information emanates from that country on which to base reasonable estimates.

In addition to the high-temperature metallurgical coke produced in 1963, more than 50 million tons of other coke was produced in gas retorts, various low- and medium-carbonization processes, and from unconventional methods of carbonization. Production from all of these sources, which is commonly referred to as soft coke,

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TABLE 22.—World production of oven and beehive coke (excluding breeze), by countries [1]

(Thousand short tons)

Country	1959	1960	1961	1962	1963
North America:					
Canada [2]	4,095	3,873	3,900	4,022	4,281
Mexico	691	481	785	854	995
United States	55,864	57,229	51,711	51,910	54,278
Total	60,650	61,583	56,396	56,786	59,554
South America:					
Argentina [2]	----------	280	440	550	660
Brazil	574	776	771	794	740
Chile	261	258	224	260	274
Colombia	273	463	358	397	441
Peru	35	33	40	44	44
Total	1,143	1,810	1,833	2,045	2,159
Europe:					
Austria	1,943	2,255	1,965	1,824	1,802
Belgium	7,955	8,295	7,948	7,931	7,941
Bulgaria	10	22	22	9	139
Czechoslovakia	8,684	9,323	9,410	9,844	10,250
Finland	11	11	[3] 17	[3] 20	[3] 11
France [4]	14,482	15,030	14,859	14,902	14,796
Germany: [4]					
East [5]	1,108	1,111	1,135	1,136	[3] 1,160
West [6]	47,251	49,252	48,992	47,504	46,069
Hungary	399	550	658	721	728
Italy	3,366	4,095	4,296	4,769	5,065
Netherlands [4]	4,501	4,979	5,020	4,711	4,707
Poland	11,992	12,437	13,170	13,859	15,299
Rumania	671	904	1,036	1,233	1,258
Spain	2,653	2,837	2,876	3,018	3,020
Sweden	133	148	293	379	[3] 386
U.S.S.R. [4]	58,860	61,986	64,600	67,163	[3] 70,500
United Kingdom	19,093	21,094	19,968	17,430	17,408
Yugoslavia	1,179	1,194	1,211	1,220	1,221
Total	184,291	195,523	197,476	197,673	201,760
Asia:					
China [3]	22,000	27,600	16,500	16,500	16,500
India	4,739	5,267	8,264	7,769	8,102
Iran [7]	23	22	22	[3] 22	[3] 22
Japan	7,848	9,424	12,030	12,729	17,020
Korea, North [3]	775	900	990	1,200	1,300
Turkey	583	583	580	565	907
Total	35,968	43,796	38,386	38,785	43,851
Africa:					
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	207	161	212	112	[3] 116
South Africa, Republic of	2,205	2,364	2,420	2,429	2,520
Total	2,412	2,525	2,632	2,541	2,636
Oceania:					
Australia	2,507	2,949	3,038	3,106	3,192
New Caledonia [3]	77	77	77	77	77
New Zealand	7	7	7	7	7
Total	2,591	3,033	3,122	3,190	3,276
World total	287,055	308,270	299,845	301,020	313,236

[1] Includes revisions of data published previously.
[2] Includes breeze and a negligible amount of gashouse coke.
[3] Estimate.
[4] Includes breeze.
[5] High-temperature coke from lignite.
[6] Includes electrode coke but excludes an estimated 100,000 tons of low-temperature coke.
[7] Year ended March 20 of year following that stated.

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however, was only about one-sixth as large as hard-coke production. The leading producers of soft coke were the United Kingdom and East Germany, which together produced 43 percent of the world total. In the United Kingdom most of this coke was produced from bituminous coal in gas retorts; more than two-thirds of the East German output was derived from brown coal. The East German lignite coke was probably a carbonized briquet because lignite or brown coal is noncoking. Other leading soft-coke producers were West Germay, Japan, and Czechoslovakia. In these countries, considerable quantities of coal gas are manufactured resulting in substantial quantities of gashouse coke.

TABLE 23.—World production of gashouse, low-, and medium-temperature coke (excluding breeze), by countries [1]

(Thousand short tons)

Country [2]	1959	1960	1961	1962	1963
North America: United States	(3)	(3)	(3)	164	160
Total [3 4]	230	230	130	275	270
South America:					
Argentina [4]	61	66	66	66	66
Brazil	4 250	4 280	314	4 310	4 310
Chile	94	4 94	4 94	4 94	109
Uruguay	31	35	25	25	23
Total	436	475	499	495	508
Europe:					
Austria	276	250	273	347	364
Belgium	1				
Czechoslovakia:					
Gashouse	713	686	565	571	4 580
Lignite	2,406	2,399	2,375	2,327	2,330
Denmark	369	439	446	461	4 440
Finland	150	152	4 130	4 330	4 170
France:					
Gashouse	1,124	766	474	271	161
Low-temperature	317	328	306	297	299
Germany:					
East:					
Gashouse [5]	3,456	3,534	3,400	3,441	4 3,470
Lignite	7,205	7,376	7,314	7,308	4 7,385
West:					
Gashouse	5,527	5,754	5,454	5,467	5,390
Lignite	656	664	662	661	661
Low-temperature	112	80	98	114	111
Greece	21	25	25	24	4 22
Hungary	529	547	534	559	4 550
Ireland (Eire)	91	106	103	4 105	4 110
Italy	882	899	862	855	793
Luxembourg	39	37	40	40	4 40
Netherlands [6]	480	322	257	220	195
Norway [6]	54	52	50	50	40
Poland:					
Gashouse	1,081	1,077	1,122	1,194	1,273
Low-temperature	4 220	4 220	4 220	4 280	280
Portugal	39	43	44	34	28
Spain	300	273	279	256	214
Sweden	680	659	661	642	617
Switzerland	515	534	529	547	375
United Kingdom	11,279	11,050	10,975	10,886	10,938
Yugoslavia	23	22	19	20	21
Total [3 4]	41,900	41,600	40,600	41,200	40,800

See footnotes at end of table.

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TABLE 23.—World production of gashouse, low-, and medium-temperature coke (excluding breeze), by countries [1]—Continued

Country [2]	1959	1960	1961	1962	1963
Asia:					
Ceylon [4]	13	13	13	11	9
Hong Kong [5]	22	20	10	19	17
India:					
Gashouse	142	141	140	138	[4] 130
Low-temperature	1,995	2,002	1,989	2,313	2,525
Japan:					
Gashouse	3,554	4,101	4,185	3,807	3,719
Low-temperature [4]	77	83	83	83	83
Malaya [4]	22	22	22	22	22
Taiwan [7]	190	214	207	123	191
Turkey:					
Gashouse	[4] 130	110	133	168	186
Low-temperature	91	93	91	93	87
Total [3 4]	6,675	7,300	7,315	7,220	7,410
Africa:					
Algeria	98	103	68	[4] 77	[4] 66
South Africa, Republic of	82	67	111	121	139
United Arab Republic (Egypt) [4]	28	33	33	39	39
Total	208	203	212	237	244
Oceania:					
Australia [8]	914	850	856	853	[4] 800
New Zealand [9]	86	80	86	97	86
Total	1,000	930	942	950	886
World total [3]	50,450	50,740	49,700	50,380	50,120

[1] Gashouse coke unless otherwise specified. Includes revisions of data published previously. Data do not add to totals shown, owing to rounding.
[2] Production data for China, Mexico, Rumania, and the U.S.S.R. not available; estimates included in totals. A negligible amount is produced in Canada.
[3] Concealed to avoid disclosing individual company data. Production included in total.
[4] Estimate.
[5] Includes high-temperature coke.
[6] Includes breeze.
[7] Includes other cokes.
[8] Year ended June 30 of year stated.
[9] Year ended March 31 of year following that stated.

COKE OVENS

SLOT OVENS

On December 31, 1963, there were 14,586 slot ovens in existence, an increase of 25 ovens over 1962 but a decrease of 1,658 ovens from the record high of 1958. This large decrease in ovens from the 1958 figure was attributed largely to advancements in iron-making which sharply reduced blast-furnace coke requirements. Also, the large construction and modernization program on coke ovens conducted by the iron and steel industries during the past decade has made available sufficient new ovens to meet current blast-furnace coke requirements. Consequently, construction activity in the oven-coke industry was at the lowest level in many years. In 1963 only 86 new ovens consisting of one additional battery (61 ovens) and the extension of an existing battery (25 ovens) were completed. A battery of 50 ovens, which has been reported as under construction for the past two years, was completed also but, not scheduled to produce coke until the spring of 1964, was classified again as being under construction. In 1963 only one battery of 61 ovens was dismantled for rebuilding.

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Modern slot ovens are durable facilities capable of producing coke for many years. As shown in table 26, the majority of slot ovens in existence at the end of 1963 were under 20 years old, but about two-fifths were over 20 years old and almost one-fifth were more than 40 years old.

Although many kinds of slot ovens have been built since the first battery of Semet-Solvay ovens in 1893, all but two batteries in the past two decades have been either Koppers or Wilputte. At the end of 1963, 68 percent of all slot ovens in existence were Koppers-Becker including old-type Koppers; 31 percent were Wilputte including Semet-Solvay; and 1 percent were all other kinds.

BEEHIVE OVENS

Table 27 shows the number of beehive-coke ovens, by States, in existence on December 31, 1963. The number of beehive ovens reported to the Bureau of Mines in recent years has fluctuated with demand for blast-furnace coke and the availability of oven coke. Since 1919, beehive-coke ovens have served as marginal producers principally for the iron and steel industries. Smaller requirements for blast-furnace coke in the past several years, however, have greatly reduced the demand for beehive coke, and the number of serviceable ovens in existence at the end of the year was the lowest on record. This total, however, included only those ovens on which the Bureau of Mines received an annual report from the owners or operators.

TABLE 24.—Slot ovens completed and abandoned in the United States in 1963, by States

State	Plants in existence Dec. 31 [1]	Ovens			
		New	Abandoned during year [2]	In existence Dec. 31	Under construction Dec. 31
Alabama	7			1,516	
California	1			315	
Colorado	1			206	
Connecticut	1			70	
Illinois	6			568	
Indiana	5			2,218	
Kentucky	1			196	
Maryland	1			757	
Michigan	4	86	61	733	
Minnesota	2			180	
Missouri	1			58	
New Jersey	1			120	
New York	3			805	50
Ohio	12			1,820	
Pennsylvania	12			3,720	
Tennessee	1			44	
Texas	2			140	
Utah	1			252	
West Virginia	3			668	
Wisconsin	1			200	
Total 1963	66	86	61	14,586	50
At merchant plants	17			1,894	
At furnace plants	49	86	61	12,692	50
Total 1962	66	190	[3] 853	[3] 14,561	[3] 50

[1] Excludes plants retired permanently during year.
[2] Includes ovens dismantled for rebuilding.
[3] Revised figure.

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It is known that there were many beehive ovens, no longer retained on the Bureau of Mines' working list because they are idle and the owners have gone out of the coke-making business, which could be pressed into service if there were an increased demand for coke and if coking coal were available. As noted in table 28, only about one-fourth of the beehive ovens on the Bureau of Mines' working list were active in 1963.

TABLE 25.—Number of slot ovens in the United States on Dec. 31, 1963, by States and kinds

State	Koppers	Koppers-Becker	Semet-Solvay	Wilputte	All others	Total
Alabama	510	633	180	130	[1] 63	1,516
California		315				315
Colorado	60	146				206
Connecticut		70				70
Illinois		238		330		568
Indiana	340	1,166	60	652		2,218
Kentucky			120	76		196
Maryland		757				757
Michigan		223	362	148		733
Minnesota	65	115				180
Missouri	18				[2] 40	58
New Jersey	55	65				120
New York	135	186	120	364		805
Ohio	667	516	176	461		1,820
Pennsylvania	961	1,546	88	1,125		3,720
Tennessee			24	20		44
Texas		140				140
Utah		252				252
West Virginia	154	514				668
Wisconsin	100		100			200
Total 1963	3,065	6,882	1,230	3,306	103	14,586
At merchant plants	398	469	624	363	40	1,894
At furnace plants	2,667	6,413	606	2,943	63	12,692
Total 1962	3,065	[3] 6,857	1,230	3,306	103	[3] 14,561

[1] Otto.
[2] Simon-Carves.
[3] Revised figure.

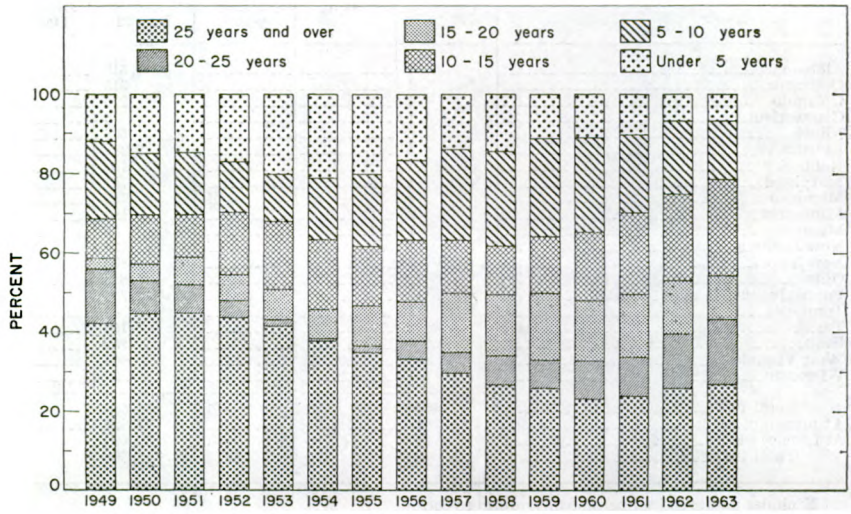

FIGURE 5.—Age of slot ovens in the United States.

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TABLE 26.—Age of slot ovens in the United States on Dec. 31, 1963 [1]

Age	At merchant plants		At furnace plants		Total	
	Number of ovens	Percent of total	Number of ovens	Percent of total	Number of ovens	Percent of total
Under 5 years	78	4.1	912	7.2	990	6.8
From 5 to 10 years	24	1.3	2,117	16.7	2,141	14.7
From 10 to 15 years	190	10.0	3,342	26.3	3,532	24.2
From 15 to 20 years	55	2.9	1,583	12.5	1,638	11.2
From 20 to 25 years	216	11.4	2,166	17.1	2,382	16.3
From 25 to 30 years	35	1.8	792	6.2	827	5.7
From 30 to 35 years						
From 35 to 40 years	412	21.8	151	1.2	563	3.9
40 years and over	884	46.7	1,629	12.8	2,513	17.2
Total	1,894	100.0	12,692	100.0	14,586	100.0

[1] Age dates from first entry into operation or from last date of rebuilding.

TABLE 27.—Beehive ovens completed and abandoned in the United States in 1963, by States

State	Plants in existence Dec. 31	Ovens			
		New or rebuilt	Abandoned during year	In existence Dec. 31	Under construction Dec. 31
Kentucky	1			200	
Pennsylvania	18	108	390	3,636	
Virginia	6	210		877	
West Virginia	1			194	
Total:					
1963	26	318	[1] 390	4,907	
1962	27	4	[1] 727	4,979	210

[1] Idle and not expected to resume production; removed from list of available ovens.

TABLE 28.—Average number of beehive ovens active in the United States in 1963, by months

Month	Number	Month	Number	Month	Number
January	1,477	May	1,899	September	1,746
February	1,487	June	1,913	October	1,718
March	1,514	July	1,714	November	1,385
April	1,890	August	1,735	December	1,375

COKING COAL

QUANTITY AND VALUE OF COAL CARBONIZED

The coke industry is the second largest bituminous-coal-consuming group in the United States, carbonizing about one-sixth of the total soft-coal output in 1963. The quantity of bituminous coal charged into slot- and beehive-coke ovens increased 5 percent over that of 1962 but was 12 percent below the 1957–59 average. In addition to the nearly 78 million tons of bituminous coal charged into coke ovens, 450,500 tons of anthracite fines was blended with bituminous coal,

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mainly at oven-coke plants specializing in the manufacture of foundry-grade coke.

Coal consumption at coke plants is generally uniform from month to month because carbonization is a continuous process. However, changes in economic or business conditions, particularly in the heavy industries, directly affect coke ovens because more than nine-tenths of the output is used in metallurgical applications. Although coke ovens, paralleling blast-furnace operations, used coal at a fairly uniform rate throughout the year, there was a spread of 1.6 million tons between the low figure in February and the high level reached in May. However, when comparing the first and last halves of 1963, only 1.9 million tons less coal was charged into ovens in the last 6 months.

The delivered cost of coal to coke plants is important because coal represents between 65 and 70 percent of costs of making coke. Transportation is one of the principal items in delivered coal costs. Many of the coke-producing centers in the United States are great distances from the coalfields, and transportation costs are greater than costs of the coking coal at the mines. Table 29 shows the quantity and value of coals of individual and groups of States.

Probably one of the most significant developments of the coke industry in 1963 was the $0.36-per-ton decrease in delivered cost of coal to oven-coke plants, which reduced the average cost per ton to the lowest figure since 1956. As might be expected, the highest cost of

TABLE 29.—Quantity and value at ovens of coal carbonized in the United States in 1963, by States

State	Coal carbonized			Coal per ton of coke	
	Short tons	Value		Short tons	Value
		Total	Average		
Oven coke:					
Alabama	5,893,990	$48,863,180	$8.29	1.38	$11.41
California, Colorado, Utah	3,885,064	49,322,622	12.86	1.59	20.48
Connecticut, Maryland, New Jersey, New York	9,140,927	105,932,779	11.59	1.44	16.67
Illinois	2,768,559	25,882,674	9.35	1.48	13.83
Indiana	10,835,622	114,871,936	10.60	1.44	15.23
Kentucky, Missouri, Tennessee, Texas	2,837,992	25,725,550	9.06	1.41	12.80
Michigan	4,742,405	46,810,466	9.87	1.37	13.53
Minnesota and Wisconsin	978,994	10,786,886	11.02	1.24	13.71
Ohio	9,088,258	79,285,202	8.72	1.43	12.51
Pennsylvania	21,895,971	185,061,601	8.45	1.44	12.14
West Virginia	4,452,256	33,270,083	7.47	1.48	11.06
Total 1963	76,470,038	725,812,979	9.49	1.43	13.62
At merchant plants	7,923,028	74,437,920	9.40	1.41	13.23
At furnace plants	68,547,010	651,375,059	9.50	1.44	13.66
Total 1962	73,342,847	722,670,474	9.85	1.44	14.14
Beehive coke:					
Pennsylvania	624,332	3,374,487	5.40	1.63	8.79
Kentucky and Virginia	988,249	4,913,483	4.97	1.68	8.37
Total:					
1963	1,612,581	8,287,970	5.14	1.66	8.54
1962	1,338,862	7,105,675	5.31	1.65	8.75

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coal was at plants farthest from their coal-supply sources, particularly those along the Great Lakes, the northeastern part of the country, and the west coast. Thus, the highest average costs of coal per ton were in California, Colorado, and Utah; the Middle Atlantic States of Maryland, New Jersey, and New York (including Connecticut); and in Minnesota and Wisconsin. West Virginia oven-coke plant operators had the lowest-cost coal followed by Alabama, Pennsylvania, and Ohio.

Although coal costs in general were lower in 1963 than for the 1957–59 period, there were several exceptions. Alabama and the Far Western States comprising California, Colorado, and Utah recorded slight increases in average costs for coal.

Coal costs for beehive-coke plants usually are much lower than for oven-coke plants because the ovens are located at or near their source of supply. A reduction of $0.17 per ton for coal at beehive plants brought the total cost per ton to the lowest figure since 1948.

TABLE 30.—Bituminous coal carbonized in coke ovens in the United States, by months

(Short tons)

Month	1957–59 (average)			1962			1963		
	Slot	Beehive	Total	Slot	Beehive	Total	Slot	Beehive	Total
January	7,974,200	220,300	8,194,500	7,468,600	171,700	7,640,300	6,028,800	109,600	6,138,400
February	7,312,300	213,300	7,525,600	6,889,000	158,000	7,047,000	5,637,200	111,900	5,749,100
March	8,125,900	251,200	8,377,100	7,536,100	158,400	7,694,500	6,603,300	110,000	6,713,300
April	7,619,800	230,500	7,850,300	7,063,700	114,100	7,177,800	6,762,900	144,300	6,907,200
May	7,833,800	198,000	8,031,800	6,338,800	96,300	6,435,100	7,139,100	167,800	7,306,900
June	7,569,600	180,700	7,750,300	5,384,600	89,700	5,474,300	6,770,500	159,600	6,930,100
July	6,531,200	138,300	6,669,500	5,063,300	75,100	5,138,400	6,398,400	142,300	6,540,700
August	5,892,900	139,900	6,032,800	5,274,900	84,500	5,359,400	5,975,700	134,200	6,109,900
September	5,849,300	132,400	5,981,700	5,263,200	85,100	5,348,300	5,905,000	133,500	6,038,500
October	6,152,600	127,100	6,279,700	5,472,700	103,600	5,576,300	6,232,600	139,000	6,371,600
November	7,116,800	129,300	7,246,100	5,397,000	107,800	5,504,800	6,107,800	128,100	6,235,900
December	7,842,200	144,300	7,986,500	5,771,400	94,600	5,866,000	6,458,200	132,300	6,590,500
Total	85,820,600	2,105,300	87,925,900	72,923,300	1,338,900	74,262,200	76,019,500	1,612,600	77,632,100

TABLE 31.—Anthracite carbonized at oven-coke plants in the United States, by months

(Short tons)

Month	1957–59 (average)	1960	1961	1962	1963
January	29,700	35,800	25,300	35,100	37,500
February	28,200	37,700	23,100	32,100	36,300
March	29,900	42,200	23,600	34,300	42,900
April	29,100	36,100	25,200	34,600	35,500
May	30,200	32,900	27,000	31,500	38,900
June	26,000	29,700	26,100	30,300	36,200
July	24,800	25,900	25,300	30,600	34,100
August	25,600	26,200	26,000	34,600	34,400
September	26,300	25,500	27,300	35,000	35,600
October	29,800	28,500	28,400	39,600	39,200
November	29,000	25,700	30,700	38,700	36,200
December	29,000	24,100	32,100	43,100	43,700
Total	337,600	370,300	320,100	419,500	450,500

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TABLE 32.—Value of coal and products per short ton of coal carbonized in the United States

Year	Oven coke					Beehive coke	
	Value of coal per ton	Value per ton of coal				Value of coal per ton	Value per ton of coal
		Coke produced	Breeze produced	Coal-chemical materials used or sold [1]	Total		
1957–59 (average)	$9.90	$12.75	$0.31	$3.84	$16.90	$6.12	$8.76
1960	9.89	12.96	.34	3.85	17.15	6.11	8.99
1961	9.79	12.45	.34	3.84	16.63	6.10	8.88
1962	9.85	12.64	.32	3.61	16.57	5.31	9.07
1963	9.49	12.25	.33	3.33	15.91	5.14	9.26

[1] Includes value of surplus gas used and tar and pitch-of-tar burned.

TABLE 33.—Average value per short ton of coal carbonized at oven-coke plants in the United States, by States

State	1957–59 (average)	1960	1961	1962	1963
Alabama	$8.13	$8.18	$8.36	$8.35	$8.29
California, Colorado, Utah	12.24	12.56	12.92	12.58	12.86
Connecticut, Maryland, New Jersey, New York	[1] 11.87	11.94	12.01	12.31	11.59
Illinois	10.65	10.17	9.84	9.66	9.35
Indiana	11.23	11.43	11.20	11.22	10.60
Kentucky, Missouri, Tennessee, Texas	10.60	9.93	8.62	9.07	9.06
Michigan	10.22	10.08	10.14	10.05	9.87
Minnesota and Wisconsin	11.46	11.32	11.07	11.13	11.02
Ohio	9.79	9.61	9.11	8.94	8.72
Pennsylvania	8.56	8.45	8.33	8.82	8.45
West Virginia	7.74	7.75	7.80	7.64	7.47
Average	9.90	9.89	9.79	9.85	9.49
Value of coal per ton of coke	14.08	14.03	14.00	14.14	13.62

[1] Includes Massachusetts.

PREPARATION OF COKING COAL

WASHED AND UNWASHED COALS

Proper preparation of coals before carbonization is necessary to produce high-quality coke. One of the first steps in preparing coals for coking is mechanical cleaning by pneumatic or wet methods. The method generally used in the coal industry involves a wet process using jigs, concentrating tables, classifiers, launder washers, dense-medium processes, flotation, and others. For this reason, all of the cleaned coal used in the coke industry is classified as washed. As shown in table 34, more than nine-tenths of the bituminous coal carbonized in slot- and beehive-coke ovens in 1963 was washed. The main purpose for washing coals is to reduce their ash and sulfur content, but washing also serves another important function. As coal varies to some extent in chemical properties in different areas of a mine, washing yields a uniform product which is important not only to coke-plant operators but also to blast-furnace and foundry-cupola operators who desire a coke with uniform chemical and physical characteristics.

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Table 34 shows the quantities of washed and unwashed coals carbonized in each State. Although it can not be determined from this table, all of the coals mined in Alabama, Colorado, and Utah that were used in slot ovens was washed before carbonization. Roughly 93 percent of the West Virginia, Pennsylvania, and eastern Kentucky coals were washed.

Table 35 summarizes for 1963 and selected previous years the use of washed coals at oven- and beehive-coke plants. The proportion of cleaned coal carbonized at oven-coke plants rose from about three-fourths of the total in 1957–59 to more than 93 percent in 1963. An even greater increase for the same period occurred at beehive-coke plants where the use of washed coal advanced from about two-thirds of the total for the base period to 88 percent.

TABLE 34.—Washed and unwashed coal carbonized in the United States in 1963, by States in which used

(Short tons)

State	Bituminous coal			Anthracite	Grand total
	Washed	Unwashed	Total		
Oven coke:					
Alabama	5,825,885	25,024	5,850,909	43,081	5,893,990
California, Colorado, Utah	3,687,622	147,442	3,835,064	----------	3,835,064
Connecticut, Maryland, New Jersey, New York	7,571,730	1,534,202	9,105,932	34,995	9,140,927
Illinois	2,416,022	342,293	2,758,315	10,244	2,768,559
Indiana	10,158,662	612,259	10,770,921	64,701	10,835,622
Kentucky, Missouri, Tennessee, Texas	2,448,483	351,306	2,799,789	38,203	2,837,992
Michigan	4,651,328	----------	4,651,328	91,077	4,742,405
Minnesota and Wisconsin	923,191	----------	923,191	55,803	978,994
Ohio	8,125,646	888,889	9,014,535	73,723	9,088,258
Pennsylvania	20,804,567	1,052,722	21,857,289	38,682	21,895,971
West Virginia	4,452,256	----------	4,452,256	----------	4,452,256
Total 1963	71,065,392	4,954,137	76,019,529	450,509	76,470,038
At merchant plants	7,240,897	299,449	7,540,346	382,682	7,923,028
At furnace plants	63,824,495	4,654,688	68,479,183	67,827	68,547,010
Total 1962	62,026,666	10,896,661	72,923,327	419,520	73,342,847
Beehive coke:					
Pennsylvania	502,379	121,953	624,332	----------	624,332
Kentucky and Virginia	921,298	66,951	988,249	----------	988,249
Total:					
1963	1,423,677	188,904	1,612,581	----------	1,612,581
1962	1,124,809	214,053	1,338,862	----------	1,338,862

TABLE 35.—Washed and unwashed bituminous coal carbonized in the United States

(Short tons)

Year	Washed coal			Unwashed coal			Total coal carbonized	Percent of total washed
	At slot ovens	At beehive ovens	Total	At slot ovens	At beehive ovens	Total		
1957–59 (average)	66,219,149	1,429,859	67,649,008	19,601,434	675,484	20,276,918	87,925,926	76.9
1960	66,709,730	1,208,781	67,918,511	12,663,537	432,629	13,096,166	81,014,677	83.8
1961	61,700,024	1,184,232	62,884,256	10,685,016	311,874	10,996,890	73,881,146	85.1
1962	62,026,666	1,124,809	63,151,475	10,896,661	214,053	11,110,714	74,262,189	85.0
1963	71,065,392	1,423,677	72,489,069	4,954,137	188,904	5,143,041	77,632,110	93.4

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BLENDING

The judicious blending of coking coals is standard operating practice at oven-coke plants. Although coal cleaning maintains the uniformity of quality of an individual coal, blending maintains the uniformity of the coking-coal admixtures. The principal objectives of blending coals are as follows: (1) to improve the chemical and physical quality and uniformity of the coke; (2) to control the pressure developed in the oven by the carbonization process; (3) to control the yield of products; and (4) to broaden the use of inferior coals. Coke plants generally have four or more mixing or blending bins depending on the different coals blended. The usual practice is to blend major proportions of high-volatile coals with minor proportions of low-volatile coals. The addition of low-volatile coal improves the physical structure of the coke and increases the yield of coke. Low-volatile coals usually are highly-expanding coals, and the proportion that can be added is limited because of possible damage to oven walls when the coke is being discharged from the ovens. The most common practice is to blend high- and low-volatile coals, although some plants also use medium-volatile coals or other blending materials such as anthracite or coal-tar pitch. In 1963, 59 of the 64 active coke plants used coals of different volatile contents. Of these, 35 (including 6 blending anthracite) used high- and low-volatile coals; 16 (including 10 blending anthracite) used high-, medium-, and low-volatile coals; 5 plants used high- and medium-volatile coals; 3 plants used medium- and low-volatile coals (all 3 blending anthracite); and 5 plants used medium-volatile coals exclusively.

Coking-coal admixtures are selected carefully, and coke-plant operators are reluctant to make frequent changes. This is clearly indicated in the data presented in table 36 which shows that the average volatile content of all bituminous coals carbonized in 1963 (30.4) was only 0.3 percent higher than the average for the 1957–59 period.

TABLE 36.—Average volatile content of bituminous coal carbonized by oven-coke plants in the United States

Year	High		Medium		Low		Total	
	Short tons	Volatile content (percent)	Short tons	Volatile content (percent)	Short tons	Volatile content (percent)	Short tons	Volatile content (percent)
1957–59 (average)	56,499,763	34.9	11,447,103	26.0	17,873,717	17.7	85,820,583	30.1
1960	52,065,009	35.5	11,113,548	25.8	16,194,710	17.5	79,373,267	30.4
1961	47,304,877	35.6	10,175,333	25.9	14,904,830	17.6	72,385,040	30.5
1962	47,846,051	35.3	10,469,256	26.1	14,608,020	17.6	72,923,327	30.4
1963	49,825,740	35.4	10,657,200	26.1	15,536,589	17.4	76,019,529	30.4

The proportions of high-, medium-, and low-volatile coals used by the coke industry have not varied greatly in the past two decades. There are wide variations, however, in the proportions of the different types used at individual plants. This is shown in table 37, which shows the receipts of coal according to volatile content by States.

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The highest proportion of high-volatile coals was used in West Virginia and the Far Western States. Alabama used the highest proportion of medium-volatile coals and the Lake States of Minnesota and Wisconsin, the highest percent of low-volatile. Merchant oven-coke plants used a greater percentage of low-volatile coal than furnace plants because a large part of their production is foundry-grade coke for which larger proportions of low-volatile coals are used in the blends.

TABLE 37.—Coal received by oven-coke plants in the United States in 1963, by consuming States and volatile content [1]

(Short tons)

Consuming State	High-volatile		Medium-volatile		Low-volatile		Total coal receipts
	Quantity	Percent of total	Quantity	Percent of total	Quantity	Percent of total	
Alabama	338,967	5.9	4,850,723	84.0	587,319	10.1	5,777,009
California, Colorado, Utah	3,419,999	81.9	583,909	14.0	171,419	4.1	4,175,327
Connecticut, Maryland, New Jersey, New York	6,711,031	70.7	374,290	3.9	2,407,328	25.4	9,492,649
Illinois	2,091,157	75.3	45,885	1.6	639,995	23.1	2,777,037
Indiana	6,052,611	55.9	1,929,294	17.8	2,846,913	26.3	10,828,818
Kentucky, Missouri, Tennessee, Texas	1,878,211	64.7	443,053	15.2	583,189	20.1	2,904,453
Michigan	3,005,164	60.9	491,542	10.0	1,440,344	29.1	4,937,050
Minnesota and Wisconsin	540,977	51.6	111,149	10.6	397,022	37.8	1,049,148
Ohio	6,952,205	76.5	217,334	2.4	1,922,116	21.1	9,091,655
Pennsylvania	15,623,866	72.3	1,749,492	8.1	4,247,744	19.6	21,621,102
West Virginia	3,745,415	83.8	----------	--------	723,554	16.2	4,468,969
Total 1963	50,359,603	65.3	10,796,671	14.0	15,966,943	20.7	77,123,217
At merchant plants	3,703,746	46.2	1,424,071	17.8	2,891,073	36.0	8,018,890
At furnace plants	46,655,857	67.5	9,372,600	13.6	13,075,870	18.9	69,104,327
Total 1962	46,938,484	64.5	11,037,644	15.2	14,773,767	20.3	72,749,895

[1] Volatile matter on moisture-free basis: High-volatile—over 31 percent; medium-volatile—22–31 percent; and low-volatile—14–22 percent.

SOURCES

Sources of coals carbonized in the United States are shown in table 38. Although bituminous coal was mined in 23 States in 1963, only 11 States shared in the production of the coals shipped to coke plants. Furthermore, 88 percent of the coals delivered to coke plants originated in Alabama, eastern Kentucky, Pennsylvania, and West Virginia. The reason that the coal obtained by oven-coke plant operators is from so few States is that not all bituminous coals possess caking or agglomerating properties and therfore can not be used in coke ovens. All bituminous-coal deposits of the Appalachian region possess caking or agglomerating properties, but because some coals in certain areas of the region contain high proportions of ash and sulfur, they are not used in making metallurgical coke. Most of the coals, however, can be upgraded to meet established specifications required in the coke industry through conventional cleaning methods. Consequently, the coking coals mined in the Appalachian region are distributed widely, as shown in table 39.

In addition to the coking coals of the Appalachian region, smaller quantities were obtained from fields in Colorado, Illinois, New Mexico, Oklahoma, and Utah.

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Coking coals are commonly classified in the United States by volatile content. Volatile matter represents that portion of a coal which is converted into volatile products (gases and vapors) when heated above its decomposition temperature in a coke oven. Three types, classified as high-, medium-, and low-volatile, are used to designate bituminous coals. The limits of volatile-matter content designating each type were established by the American Society for Testing and Materials to be high-volatile, over 31 percent; medium-volatile, 22–31 percent; and low-volatile, 14–22 percent.

The better-quality high-volatile and medium-volatile coals are found in West Virginia, Pennsylvania, eastern Kentucky, and Alabama. Low-volatile coals, as already pointed out in the preceding section on blending, are used for improving the physical properties of metallurgical coke, especially its strength, are obtained largely from West Virginia and central Pennsylvania. In preceding years, some low-volatile coals have been obtained from western Arkansas but none were obtained from that State in 1963, and only a few hundred tons were received from eastern Oklahoma.

TABLE 38.—Origin of coal received by oven-coke plants in the United States in 1963, by producing fields and volatile content

(Short tons)

State and field [1] where coal was produced	Volatile content [2]			Total
	High	Medium	Low	
Alabama	324,477	4,806,775		5,131,252
Colorado	1,103,511	468,309		1,571,820
Illinois	1,261,939			1,261,939
Kentucky:				
Elkhorn	5,793,424			5,793,424
Harlan	2,533,141			2,533,141
New Mexico	279,003			279,003
Oklahoma	281,586	376,424	121	658,131
Pennsylvania:				
Anthracite			434,979	434,979
Bituminous:				
Central Pennsylvania		270,651	1,488,207	1,758,858
Connellsville	4,362,313	9,673		4,371,986
Freeport	2,415,877			2,415,877
Pittsburgh	12,316,501			12,316,501
Somerset			259,143	259,143
Westmoreland	365,309			365,309
Tennessee		7,458		7,458
Utah	2,037,384			2,037,384
Virginia:				
Buchanan	81,566	667,539		749,105
Clinch Valley		192,524		192,524
Pocahontas			196,405	196,405
Southwestern	1,199,813	1,034,117		2,233,930
West Virginia:				
Coal River	443,890			443,890
Fairmont	5,620,324			5,620,324
Kanawha	5,292,576			5,292,576
Kenova-Thacker	1,388,077			1,388,077
Logan	2,891,879	279,348		3,171,227
New River			547,285	547,285
Pocahontas		1,544,637	11,126,318	12,670,955
Randolph-Barbour	67	856		923
Tug River			43,653	43,653
Webster-Gauley	366,946	1,118,729		1,485,675
Winding Gulf		19,631	1,870,832	1,890,463
Total	50,359,603	10,796,671	15,966,943	77,123,217

[1] As defined by the U.S. Coal Commission of 1922.
[2] Volatile matter on moisture-free basis: High-volatile—over 31 percent; medium-volatile—22–31 percent; and low-volatile—14–22 percent.

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TABLE 39.—Origin of coal received by oven-coke plants in the United States in 1963, by States

(Short tons)

Consuming State	Coal produced in—					
	Alabama	Colorado	Illinois	Kentucky	New Mexico	Oklahoma
Alabama	5,131,252			14,490		
California, Colorado, Utah		1,571,820			279,003	110,706
Connecticut, Maryland, New Jersey, New York				1,251,884		
Illinois			810,514	1,064,632		
Indiana			451,353	3,455,756		
Kentucky, Missouri, Tennessee, Texas						547,425
Michigan				1,352,597		
Minnesota and Wisconsin				156,389		
Ohio			72	600,323		
Pennsylvania				400,074		
West Virginia				30,420		
Total 1963	5,131,252	1,571,820	1,261,939	8,326,565	279,003	658,131
At merchant plants	500,215			33,641		
At furnace plants	4,631,037	1,571,820	1,261,939	8,292,924	279,003	658,131
Total 1962	5,752,772	1,425,916	940,971	8,231,039	245,926	762,215

Consuming State	Coal produced in—					
	Pennsylvania	Tennessee	Utah	Virginia	West Virginia	Total
Alabama	45,698	7,458			578,111	5,777,009
California, Colorado, Utah			2,037,384		176,414	4,175,327
Connecticut, Maryland, New Jersey, New York	2,936,049			368,432	4,936,284	9,492,649
Illinois	10,496			67,721	823,674	2,777,037
Indiana	65,727			750,688	6,105,294	10,828,818
Kentucky, Missouri, Tennessee, Texas	35,069			214,445	2,107,514	2,904,453
Michigan	86,611			488,904	3,008,938	4,937,050
Minnesota and Wisconsin	45,928			4,104	842,727	1,049,148
Ohio	3,894,590			177,891	4,418,779	9,091,655
Pennsylvania	11,362,643			1,299,779	8,558,606	21,621,102
West Virginia	3,439,842				998,707	4,468,969
Total 1963	21,922,653	7,458	2,037,384	3,371,964	32,555,048	77,123,217
At merchant plants	383,013			738,705	6,363,316	8,018,890
At furnace plants	21,539,640	7,458	2,037,384	2,633,259	26,191,732	69,104,327
Total 1962	20,940,074	13,600	1,875,065	3,174,277	29,388,040	72,749,895

CAPTIVE COAL

The oven-coke industry purchases less than 40 percent of its coking-coal requirements and obtains the balance from mines owned by the coke-producing companies. This is known as "captive" coal and ordinarily does not move in commercial channels, but is mined as needed by the coke-producing companies. By owning the coal mines, coke-plant operators have better control of the quality and supply of coking coals. It is evident from the data shown in table 40 that the optimum proportions of "captive" coal desired by the coke-oven operators was reached in the mid 1950's. For example, since the 1957–59 period, the proportion of captive coal obtained by oven-coke operators has varied only 0.4 percent, and was 61 percent in 1963. These data also show that furnace plants use a greater proportion of captive coal than merchant plants.

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TABLE 40.—Quantity and percentage of captive coal received by oven-coke plants in the United States

(Short tons)

Year	At merchant plants			At furnace plants			Total		
	Total coal received	Captive coal		Total coal received	Captive coal		Total coal received	Captive coal	
		Quantity	Percent		Quantity	Percent		Quantity	Percent
1957–59 (average)	10, 270, 085	4, 523, 385	44. 0	76, 660, 207	48, 941, 264	63. 8	86, 930, 292	53, 464, 649	61. 5
1960	8, 726, 368	3, 834, 264	43. 9	71, 353, 799	45, 091, 010	63. 2	80, 080, 167	48, 925, 274	61. 1
1961	7, 727, 607	3, 214, 284	41. 6	66, 547, 998	42, 354, 003	63. 6	74, 275, 605	45, 568, 287	61. 4
1962	7, 337, 664	3, 361, 357	45. 8	65, 412, 231	41, 377, 978	63. 3	72, 749, 895	44, 739, 335	61. 5
1963	8, 018, 890	3, 642, 257	45. 4	69, 104, 327	43, 502, 197	63. 0	77, 123, 217	47, 144, 454	61. 1

STOCKS

Stocks of bituminous coal and anthracite at oven-coke plants by months for the years 1959–63 are shown in tables 41 and 42. Stocks of bituminous coal are very important to oven-coke producers because of the continuous nature of the coking process. For this reason, operators try to maintain at least a 30-day supply at normal operations which can be extended much longer if there are any serious interruptions in their coal supply. Stocks decreased only 4 percent during 1963, but because of a higher operating rate in December, the supply of coal stood at only 38 days compared with 45 days at the end of 1962. As will be noted in table 41, stocks generally increase during the summer and fall and decline in the first quarter and December of each year. This is caused mainly by the movement of coal on the Great Lakes. A few coke plants located on the Lakes obtain most of their coal by boat. During the shipping season these plants always build up their stockpiles to be drawn upon during the winter months.

Anthracite stocks are small when compared with those of bituminous coal. As only a small proportion of anthracite is used in the coking-coal admixtures by foundry-coke producers, anthracite stocks are not as important to oven-coke plant operators as bituminous stocks.

TABLE 41.—Month-end stocks of bituminous coal at oven-coke plants in the United States

(Short tons)

Month	1959	1960	1961	1962	1963
January	12, 123, 513	11, 428, 017	10, 483, 155	9, 778, 578	7, 338, 642
February	11, 801, 729	11, 241, 870	9, 788, 567	9, 407, 933	7, 232, 935
March	11, 684, 172	11, 148, 141	9, 551, 136	9, 404, 688	6, 595, 093
April	11, 569, 096	11, 324, 365	9, 331, 749	9, 431, 344	6, 883, 100
May	11, 337, 123	11, 916, 169	9, 851, 556	9, 668, 244	7, 647, 971
June	12, 424, 308	12, 391, 359	9, 932, 172	10, 360, 167	9, 202, 228
July	9, 566, 108	10, 342, 992	8, 495, 602	8, 256, 963	6, 396, 167
August	9, 394, 516	10, 742, 409	8, 936, 261	8, 276, 856	6, 918, 806
September	9, 261, 161	10, 918, 346	9, 135, 237	8, 179, 859	7, 290, 283
October	9, 375, 872	11, 082, 639	9, 313, 136	8, 622, 170	7, 911, 761
November	10, 127, 812	11, 203, 784	10, 452, 933	8, 849, 458	8, 054, 381
December	11, 495, 611	11, 028, 816	10, 392, 751	8, 305, 379	8, 014, 046

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TABLE 42.—Month-end stocks of anthracite at oven-coke plants in the United States

(Short tons)

Month	1959	1960	1961	1962	1963
January	87,314	77,724	74,624	85,037	99,088
February	71,101	65,831	62,092	72,282	73,173
March	49,463	50,517	50,036	58,826	51,011
April	61,706	55,222	51,222	51,201	44,880
May	73,204	67,100	54,241	52,181	40,473
June	84,874	71,499	57,494	52,652	55,515
July	74,957	68,800	58,947	61,979	58,471
August	95,529	86,143	59,811	71,150	71,982
September	96,480	89,366	73,292	88,897	87,493
October	106,230	108,090	98,923	101,987	110,091
November	117,243	107,542	109,281	122,315	121,476
December	108,893	92,848	98,381	115,338	113,620

TECHNOLOGY

High-temperature coal carbonization currently utilizes more bituminous coal than all other conversion processes combined, and continuing improvements in producing facilities and operating techniques are essential for the maintenance of this position. One area of carbonization in which there was considerable interest in the United States as well as many foreign countries was in the use of weakly-coking coals to produce a low-temperature char which could be used as a blend component to improve the quality of metallurgical coke obtained from poor-caking high-volatile coal. The technical feasibility of this approach has been established in a number of investigations such as those in the United States conducted by the Colorado Fuel and Iron Corp. and the Kaiser Steel Corp. on western coals, Cerchar in France, and the Division of Coal Research of the Commonwealth Scientific and Industrial Research Organization in Australia. The attraction of this process is that the additive is obtained from the coal itself, that is, the char which is blended with the coal is prepared by the low-temperature carbonization of the same coal. It may be possible, therefore, to obtain a satisfactory metallurgical-grade coke from a coal which when carbonized alone yields an unsatisfactory coke. This procedure could find application in France, India, Japan, and in the western part of the United States.

In 1963, the Bureau of Mines continued its research program initiated in 1962 at the Denver (Colo.) Research Laboratory on the technical and economic feasibility of producing nonagglomerating char from subbituminous coal carbonized at 930° F using a continuous-entrainment carbonization process. Variables studied were coal-feed rate, particle size, length of carbonizer, predrying of feed, and method of heating. It was found that the degree of devolatilization increased when coal rates decreased and was substantially independent of reactor length over the range tested. Particle size of the coal feed was found to influence the yield of products, as smaller coal particles increased the char yield and decreased the yield of tar and light oil whereas larger coal particles decreased the char yield and increased the yield of liquid products.

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Other factors in the process were also studied such as the velocity of the air or gas stream in the carbonizer and the length of the carbonizer. It has been found that the velocity of the air or gas is a sensitive factor, and that a greater range in length-to-diameter ratio is needed to further evaluate the carbonization process. To meet these needs, design work was begun on a new refractory-lined carbonizer to which coal will be fed at virtually zero velocity by a screen conveyor. The new carbonizer will be 4 inches in diameter by 24 feet long, increasing the maximum length-to-diameter ratio from about 30 to 72 and reducing the coal throughput and man-hours required to make a run.

In an effort to increase the use of Illinois coal in the production of metallurgical coke in the Chicago-St. Louis area, the Illinois State Geological Survey continued to make laboratory and pilot-plant studies of blends of Illinois coal with other coals. One of the principal economic considerations that favors the use of Illinois coals is its proximity to the Chicago-St. Louis coke plants with resulting lower transportation costs than the eastern coals. In 1963, Illinois coal could be shipped to Chicago and into the East St. Louis area by rail for $1.52 and $3.34 per ton, respectively, less than eastern high-volatile coking coals. Illinois coals, however, are much poorer coking than the eastern coals, and except for some of the deposits in southern Illinois, are too high in sulfur to meet metallurgical-coal standards. In the southern part of the State, there are considerable reserves of Illinois No. 6- and Illinois No. 5-bed coals in which the sulfur can be reduced 0.9 to 1.5 percent. These coals are used currently to a limited extent in iron- and steel-company coke plants in the Chicago-St. Louis area and approximately 1.3 million tons was carbonized in 1963. In the past few years hundreds of tests of Illinois coals have been made by the Illinois Geological Survey, and results of these tests made during the past year were summarized in an article published in May 1963.[3]

For several years the U.S. Steel Corp. has evaluated the carbonization characteristics of coals by petrography. Continuing these studies at its Geneva (Utah) works, this company utilized petrographic reflectance data, in combination with chemical analysis, to determine the degree of coalification, coal-blend proportions, and criterial oxidation level, and to estimate the coke strength (ASTM coke stability factor) for Geneva-type blends containing 70 to 80 percent high-volatile coal and for single coals. The petrographic analyses were found to be rapid and inexpensive, and where applicable could provide a practical quality-control tool for coke-plant operators. In addition, the petrographic reflectance method of coal examination was believed to be particularly useful in the evaluation of small coal samples, such as exploration or drill cores where sample size limits the amount of physical test work possible.[4]

The Soviet Union has made tremendous strides in coal carbonization since World War II, largely because of the comprehensive research and development program it maintains in this field. Most of the

[3] Jackman, H. M. Illinois Coal and its Use in Metallurgical Coke. Blast Furnace and Steel Plant, v. 51, No. 5, May 1963, pp. 358-364.
[4] Gin, T. T., C. L. Dahl, and D. G. Wilson. Petrographic Evaluation of Coking Coals. Blast Furnace and Steel Plant, v. 52, No. 3, March 1964, pp. 237-243 and 290.

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research studies are conducted at two Institutes directly responsible to the State authorities controlling the coke industry and are as follows: the Ukrainian Scientific Research Institute for the Chemistry of Coal (UKhIN) at Kharkov and the Eastern Scientific Research Institute for the Chemistry of Coal (VUKhIN) at Sverdlovski. Basic research is done also at Institutes of the Academy of Science, such as the Institute of Mineral Fuels in Moscow. UKhIN, established in 1931, is the main research center, consisting of 6 field laboratories at various Ukrainian coke plants, and in 1962 had about 30 pilot plants operating at different works. This Institute is responsible for research work on all scales, laboratory, pilot, and industrial, and it also introduces new techniques into general practice. Additional information on the research efforts, coke-plant practice, and coke-oven products produced in this country were described and published recently in an article.[5]

The Bureau of Mines, in addition to its research work on continuous-entrainment carbonization described above, continued laboratory and pilot-plant studies covering various other aspects of coal carbonization. The effect of coking rate on a blend of six coals normally used by western iron and steel coke plants was studied and results summarized in a report.[6] Four Utah and Colorado high-volatile bituminous coals and two medium-volatile coals from Colorado and Oklahoma were used in this study. Tests were conducted in the Bureau's 500-pound experimental coke oven with blend percentages, size distribution, surface moisture, and bulk density held constant.

Twelve high-temperature carbonization tests were made, two each at flue temperatures of 2,140°, 2,180°, 2,280°, 2,380°, and 2,480° F and single tests at 2,080° and 2,280° F. These temperatures gave coking rates of 0.56 to 1.35 inches per hour. A slow rate of coking (lower temperatures) resulted in larger, denser coke within the range of coking rates studied. Slowly heated coke was more resistant to shatter breakage; however, it generally produced more fines in the tumbler test. This study was conducted in cooperation with the Colorado School of Mines Research Foundation, Inc., Kaiser Steel Corp., Columbia-Geneva Steel Div. of the U.S. Steel Corp., and the Colorado Fuel and Iron Corp.

A small-scale carbonization assay test, originally reported in 1953 and again in 1958, with modification for use at high temperatures, continued to be useful in predicting char, tar, and light-oil yields from larger equipment. During 1963, over 50 carbonization assays were completed. Twenty-nine of these were made in connection with coal exploration work in Texas, in cooperation with the Texas Power and Light Co., and in New Mexico in cooperation with the Utah Construction and Mining Co. The rest of the assays were made in connection with research on oxidation effects, entrainment carbonization, and metallurgical coke.

Coal from a 19-foot seam from a little-known coal deposit in northern Alaska near the Arctic Ocean was tested in a 50-pound retort. This coal was blended with two lower-volatile coals that are

[5] Wynn, A. H. A., and G. W. Lee. The Coking Industry in the U.S.S.R. Journal of the Institute of Fuel, v. 36, No. 275, Dec. 1963, pp. 533-538.
[6] Landers, W. S., Manuel Gomez, and E. O. Wagner. Coking Rate Study on a Commercial Blend of Western Coals. BuMines Rept. of Inv. 6289, 1963, 26 pp.

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known to produce satisfactory coke when blended with Sunnyside (Carbon County, Utah) coals. Various percentages of the low-volatile coals were blended with the Alaskan coal consisting of 7.5, 10, and 12.5 percent for each of the two blending coals so that the percentages ranged below and above those used in the industrial blend with Sunnyside coal. The resulting cokes were nearly as strong as the Sunnyside-based industrial coke, indicating that the Alaskan coal would be technically useable as a base coal in a coking-coal blend.

In the continuing survey on coking properties of American coals, 28 samples of coals from the Pittsburgh, Lower Kittanning, Stockton-Lewis, Coalburg, Winifrede, Cedar Grove, Peerless, No. 2 Gas, Powellton, and Eagle beds in Kanawha County, W. Va., were tested and results published.[7] A similar report was published covering the results of carbonizing tests made of 26 samples of coals from the Upper Freeport, Lower Freeport, Upper Kittanning, Middle Kittanning, and Brookville beds of Elk, Clarion, Jefferson, Clearfield, and Centre Counties, Pa.[8]

The mechanism of coke formation was studied. Tests were made to determine the effect of vacuum on the evolution of volatile products from the layers of coal. The purpose of this investigation was to determine to what extent the primary decomposition products recombine and/or condense while passing through a charge of coal during carbonization. Both thin-bed and thick-bed carbonization was employed. Thin-bed carbonization was carried out on 35-mesh coal approximately 1 coal particle thick; coal in the thick bed was 100 times thicker than in the thin bed. Differences in weight losses obtained during carbonization of these two beds indicated that the primary volatile matter is retained in thick-bed carbonization, either by recombination and condensation or surface cracking. At lower temperatures, the loss from thin-bed carbonization of a Pittsburgh-seam coal was greater than that from thick-bed carbonization. At 500° and 550° C the losses were essentially the same. This behavior is to be expected because approximately 90 percent of the total volatile liquid product is released during the plastic range.

Research aimed at developing a rapid assay method for low-temperature tar was continued in Bureau of Mines laboratories in 1963. Both atmospheric and vacuum-distillation methods were tested. Distillation at reduced pressure slightly lowered phenol recovery and increased recovery of dihydric phenolics by the same amount. Vacuum distillation also reduced the recovery of resin acids. Both methods yielded pitch that was similar in softening point and carbon to hydrogen ratio. In view of these results, it was concluded that the choice of distillation method should be left to the user, since it may be that one method is more acceptable in a given situation.

Much effort in recent years has been devoted to the characterization of the constituents of low-temperature tar. Results of much of this work is summarized in a chapter of a book published in 1963.[9]

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[7] Birge, G. W., D. E. Wolfson, and J. H. Lynch, Jr. Carbonizing Properties of Kanawha County, W. Va., Coals. BuMines Rept. of Inv. 6244, 1963, 21 pp.

[8] Birge, G. W., D. E. Wolfson, and J. H. Lynch, Jr. Carbonizing Properties of Coals from Elk, Clarion, Jefferson, Clearfield, and Centre Counties, Pa. BuMines Rept. of Inv. 6261, 1963, 22 pp.

[9] Karr, Clarence J., Jr. Low-Temperature Tar. Chapter 13, Chemistry of Coal Utilization (Supp. Vol.) ed. by H. H. Lowry. John Wiley & Sons, Inc., New York-London, 1963, pp. 539–579.

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Pitch resins and pitch oils were studied by means of liquid chromatography and gas chromatography.[10] The liquid-chromatography method was used to analyze pitch-oil fractions boiling between 290° and 315° C. These fractions contained about 70 components of which 10 major ones were identified as dibenzofuran, fluorene, and various of their methyl derivatives. These results emphasize the importance of five-membered rings and ether oxygen in the constitution of pitch oil, a fact not obtained from prior assumptions about composition.

By means of gas-solid chromatography on an aluminum-coated column, nine different N-paraffins and alpha-olefins in the C_{15} through C_{20} range were tentatively shown to be present in an aliphatic pitch-oil fraction.

The structure of pitch resin was determined by a combination of pyrolyses and gas chromatography.[11] The results indicated that the resins are made largely of isolated benzene rings joined by naphthenic systems. This method has the advantage of indicating differences in the fundamental structure of pitch resins from different sources. Studies indicating these differences were made on pitch resins from low-temperature lignite, subbituminous- and bituminous-coal tars, and a commercial electrode-binder pitch.[12]

Research was continued on the upgrading of low-temperature tars into marketable chemicals by separation and conversion of selected tar fractions.

Carbon electrodes prepared from a blend of low-temperature and high-temperature tar-pitch binders were compared with electrodes prepared with a commercial pitch binder. The electrodes made with the blend of tar-pitch binders were undesirably low in apparent density and crushing strength, indicating a brittle product. Electrical resistivity and CO_2 reactivity were high, portending high carbon and power consumption.

Studies were made on the production of phthalic and maleic anhydrides from the neutral oils of a low-temperature lignite tar. The neutral oils were first dealkylated over a silica-alumina catalyst, then oxidized over a vanadium catalyst. In preliminary tests the 210° to 270° C dealkylated product yielded 34.2 percent phthalic anhydride, compared with only 4.7 percent from the nondealkylated fraction. The 75° to 210° C dealkylated fraction yielded 25.3 percent maleic anhydride.[13]

Low-temperature tar contains a large amount of high-boiling alkylated phenols that have no market value unless dealkylated or cracked to cresylic acid. Tests were made in a fixed-bed reactor at temperatures ranging from 750° to 950° F using a variety of cracking catalysts. Silica-alumina proved to be the most effective catalyst and gave yields of 23 percent of acid boiling below 230° C.

[10] Karr, Clarence J., Jr., Edward E. Childers, and William C. Warner. Analyses of Aromatic Hydrocarbon Samples by Liquid Chromatography with Operating Conditions Analogous to Those of Gas Chromatography. Anal. Chem., v. 35, No. 9, Aug. 1963, pp. 1290–1291.

[11] Karr, Clarence J., Jr., Joseph R. Comberiati, and Patricia A. Estep. Structure Determination of Resins From Pitch of Low-Temperature Tar by Combined Pyrolyses and Gas-Liquid Chromatography. Fuel, v. 42, No. 3, May 1963, pp. 211–218.

[12] Karr, Clarence J., Jr., Joseph R. Comberiati, and William C. Warner. Comparison of Pitch Resins From Different Sources by Combined Pyrolyses and Gas-Liquid Chromatography. Anal. Chem., v. 35, No. 10, Sept. 1963, pp. 1441–1444.

[13] Berber, John S., and Arthur L. Hiser. Vapor Phase Oxidation of Hydrocarbons in Low Temperature Coal Tar. BuMines Rept. of Inv. 6222, 1963, 15 pp.

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Biodegradable detergents can be made from the straight-chain alpha olefins in low-temperature tar. Several experiments were conducted on the urea adduction of straight-chain aliphatics from the neutral oil of Texas lignite tar which yielded about 12 weight-percent of the pure straight-chain aliphatics. Infrared spectra showed that that there was a relatively large amount of alpha olefins in this pure product, but no branched aliphatics. Alkylbenzene suitable for the production of biodegradable detergents were prepared directly from this N-olefin-paraffin mixture. The yield of the alkylbenzene was 25 percent, based on the feed mixture.

Phenolic resins were prepared by reacting a crude tar-acid fraction boiling from 230° to 266° C with formaldehyde using basic catalysts. Reaction conditions and catalyst concentrations were varied, and the physical properties and cure time of the resins were evaluated for possible applications as laminating resins. The tar-acid laminate compared favorably with industrial laminates in hardness and fluxional strength, but failed in electrical properties.

The thermal decomposition of tar obtained from fluidized carbonization of coal at low temperature was studied. Most of the emphasis of these studies was devoted to the neutral oils and pitch which are the two largest fractions obtained in tar distillation. Work progressed on converting olefins in the neutral oil to alcohols which are potentially valuable as detergents and plasticizer intermediates. Tests were planned on dehydrogenation of the pitch in order to increase its aromaticity for possible use in the manufacture of carbon electrodes.

The British Coke and Research Assoc., Chesterfield, Derbyshire, England, publishes a quarterly guide of published material of interest to the carbonization industry. This review consists of a complete bibliography of publications and articles on coking. In addition, a brief summary or digest of the more important articles and publications is included in each quarterly report.

COAL CHEMICALS

GENERAL REVIEW

Four basic coal-chemical materials—tar, ammonia, light oil, and gas—are recovered at oven-coke plants from the high-temperature carbonization of coal in slot ovens. Except for ammonia (recovered as an aqueous solution or converted to a salt and sold as produced) these materials are, in most instances, further processed to yield a number of primary chemicals of which the most important are benzene, toluene, xylene, solvent naphtha, naphthalene, crude chemical oil, creosote oil, pitch, and pyridine. Yields of the basic, as well as the primary chemicals, vary somewhat according to the kind of coals carbonized, operating techniques, and recovery equipment used but, of the products resulting from carbonization, approximately 16 percent (on a weight basis) is recovered as gas and 5 percent as tar, while light oil and ammonia each comprise about 1 percent of the total. In standard units of measure, there were 10,470 cubic feet of gas, 8.78 gallons of tar, 2.91 gallons of light oil, and 19.23 pounds of ammonia (in terms of sulfate equivalent) produced for each ton of coal carbonized in slot ovens in 1963. Table 43 shows production and sales

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of coal-chemical materials and derivatives at oven-coke plants in 1963.

Figure 6 shows the relative yields of coke and basic coal-chemical materials since 1930. Although yields have varied only slightly from year to year, the figure illustrates that more gas and chemicals were recovered in periods of low industrial activity when there was less demand for coke. This situation prevailed during the 1930's when operating rates of ovens were low and coking cycles were longer than normal to provide for the maximum recovery of gas and chemicals which were in demand and readily marketable at that time. Yields fell substantially during the World War II period when producers operated ovens for maximum coke recovery and, after the war, changes in the supply and demand patterns of coke, gas, and chemicals kept yields below the levels attained in the 1930's. In recent years yields have varied somewhat because of changes in coal mixes and other factors, but they have not changed appreciably in the past two decades and, in fact, were not much different in 1963 than in the 1920's.

Since 1930, however, the value of the coal-chemical materials produced, relative to the total value of all products, has been steadily decreasing. In 1930, 43 percent of the total value of all products of oven-coke plants was credited to chemicals (ammonia products, light oil and derivatives, and tar and derivatives) and surplus gas. During the years following, the relative value of these products decreased only slightly, but in the 1950's their value declined steadily and, by the end of the decade, only about 25 percent of the revenue from all products was derived from chemicals and gas. Since then, this percentage has continued to decrease and, in 1963, the value of these products was only 21 percent of the total.

The foregoing changes are depicted graphically in figure 7. Although most of the decline was due to lower credits from the sale of surplus gas for residential and commercial heating, the value of chemicals relative to the value of all oven-coke products also has decreased, particularly in the past decade. The decline in the value of chemicals was the direct result of petrochemicals competition which, in recent years, has become increasingly keen because of the development of new methods for producing high-purity, lower-cost products from natural gas and petroleum.

Table 45 shows the average value of coal-chemical materials recovered (used or sold) from each ton of coal carbonized. Compared with 1957–59, both chemicals and gas have declined in value. Most of the decrease, however, was caused by lower returns from the sale of chemicals which declined 20 percent in value since 1957–59. The decrease in the value of chemicals was due principally to sharp reductions in the prices of light-oil derivatives, particularly benzene which represents about three-fourths of the total dollar value of all light-oil products sold, and which has declined in value about $0.10 per gallon since 1957–59. Surplus gas, which currently represents 46 percent of the total dollar value of chemical materials recovered, declined 4 percent in value during this period, and tar and ammonia products declined 16 percent and 12 percent, respectively.

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Table 46 shows the percentage of coal costs recovered from the sale of various coal-chemical materials in recent years. Although the proportion, currently, is substantially lower than in the early 1930's when about two-thirds of the cost of the coals carbonized was recovered from the sale of chemicals and gas, the recovery of these products still is of major importance to coke-plant operators and in 1963, their value was equal to 35 percent of the cost of coals. The percentage of coal costs offset by coal-chemical materials in 1963, however, was 4 percent lower than in 1962 and 10 percent less than in the base years.

TABLE 43.—Coal-chemical materials, exclusive of breeze, produced at oven-coke plants in the United States in 1963 [1]

Product	Produced	Sold			On hand Dec. 31
		Quantity	Value		
			Total	Average	
Tar, crude gallons	671,875,628	[2] 290,698,355	$31,110,909	$0.107	34,960,682
Tar derivatives:					
Sodium phenolate or carbolate do	3,360,918	3,236,389	354,893	.110	268,218
Crude chemical oil (tar acid oil) do	25,169,861	26,183,324	4,803,782	.183	940,703
Pitch-of-tar: [3]					
Soft short tons	639,055	181,994	3,728,477	20.487	14,377
Hard do	393,568	[4] 141,999	4,867,118	34.276	56,957
Other tar derivatives [5]			10,097,240		
Ammonia products:					
Sulfate short tons	619,680	621,576	15,904,898	25.588	113,672
Liquor (NH_3 content) do	14,662	12,697	906,247	71.375	1,875
Diammonium and monoammonium phosphate short tons	42,224	40,482	3,806,057	94.019	6,578
Total			20,617,202		
Sulfate equivalent of all forms short tons	718,778	711,310			127,523
NH_3 equivalent of all forms do	185,301	183,376			32,875
Gas:					
Used under boilers, etc. thousand cubic feet	[4] 800,582,375	80,049,588	15,662,374	.196	
Used in steel or allied plants do		390,342,904	88,296,205	.226	
Distributed through city mains do		20,808,789	8,671,867	.417	
Sold for industrial use do		24,882,697	4,090,606	.164	
Total do	800,582,375	516,083,978	116,721,052	.226	
Crude light oil gallons	[7] 218,165,707	32,610,305	3,632,984	.111	4,680,775
Light oil derivatives:					
Benzene:					
Specification grades (excluding Motor grade) gallons	112,427,410	110,200,042	24,192,014	.220	9,967,102
Motor grade do	2,907,016	2,919,149	498,705	.171	6,076
Toluene (all grades) do	25,794,419	24,825,639	4,849,243	.195	2,280,468
Xylene (all grades) do	6,888,320	7,123,527	1,693,892	.238	789,859
Solvent naphtha (crude and refined) gallons	3,560,953	3,359,390	712,974	.212	315,559
Other light oil derivatives do	4,432,335	2,569,623	233,639	.091	168,164
Total do	156,010,453	150,997,370	32,180,467	.213	13,527,228
Intermediate light oil do	4,847,079	3,378,397	374,447	.111	322,598
Grand total			228,488,571		

[1] Includes products of tar distillation conducted by coke-oven operators under same corporate name.
[2] Includes 28,081,874 gallons sold to affiliated companies for refining and a small amount exported.
[3] Soft—water-softening point less than 110° F; medium—from 110° to 160° F; hard—over 160° F. Figures on hard pitch include small amount of medium pitch.
[4] Includes small amount exported.
[5] Creosote oil, cresols, cresylic acid, naphthalene, phenol, pyridine, refined tar, tar paint.
[6] Includes gas used for heating ovens and gas wasted.
[7] 185,794,876 gallons refined by coke-oven operators to make derived products shown.

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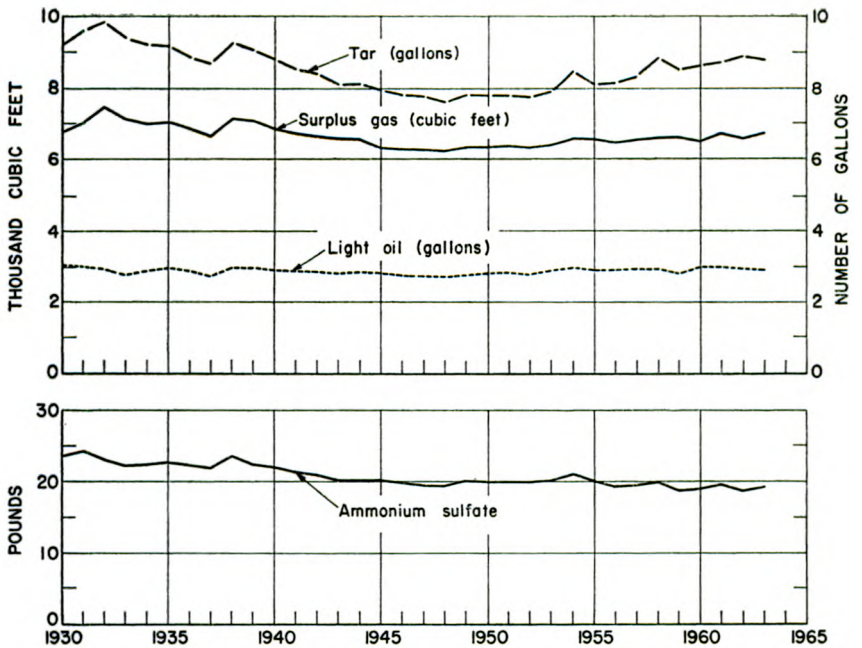

FIGURE 6.—Average yield of principal coal-chemical materials per short ton of coal carbonized in slot ovens in the United States. Yields of light oil and ammonium sulfate equivalent represent average for plants recovering these products.

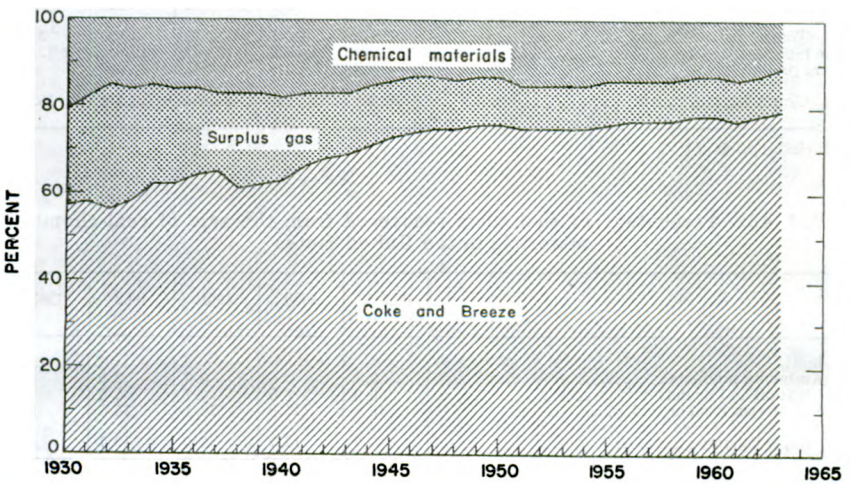

FIGURE 7.—Percentage of total value of coke-oven products from slot ovens supplied by coke and breeze, surplus gas, and chemical materials in the United States.

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TABLE 44.—Coal equivalent of the thermal materials, except coke, produced at oven-coke plants in the United States

Year	Materials produced				Estimated equivalent in heating value [1] (Billion Btu)					Coal equivalent (thousand short tons)
	Coke breeze (thousand short tons)	Surplus gas (billion cubic feet)	Tar (thousand gallons)	Light oil (thousand gallons)	Coke breeze	Surplus gas	Tar	Light oil	Total	
1913	735	64	115,145	3,000	14,700	35,200	17,272	390	67,562	2,600
1918	1,999	158	263,299	87,562	39,980	86,900	39,495	11,383	177,758	6,785
1929	4,853	508	680,864	200,594	97,060	279,400	102,130	26,077	504,667	19,262
1939	3,354	434	554,406	170,963	67,080	238,700	83,161	22,225	411,166	15,693
1949	4,929	546	672,407	228,754	98,580	300,300	100,861	29,738	529,479	20,209
1957–59 (average)	4,077	568	732,173	244,118	81,532	312,400	109,826	31,735	535,493	20,439
1960	3,705	521	687,560	234,501	74,100	286,550	103,134	30,485	494,269	18,865
1961	3,337	490	633,378	214,003	66,740	269,500	95,007	27,820	459,067	17,522
1962	3,425	484	650,112	211,688	68,500	266,200	97,517	27,519	459,736	17,547
1963	3,609	516	671,876	218,166	72,180	283,800	100,781	28,362	485,123	18,516

[1] Breeze, 10,000 Btu per pound; gas, 550 Btu per cubic foot; tar, 150,000 Btu per gallon; and light oil, 130,000 Btu per gallon.

TABLE 45.—Average value of coal-chemical materials used or sold and of coke and breeze produced per short ton of coal carbonized in the United States

Product	1957–59 (average)	1960	1961	1962	1963
Ammonia products	$0.307	$0.274	$0.317	$0.286	$0.270
Light oil and its derivatives	.687	.739	.661	.545	.473
Surplus gas used or sold	1.592	1.577	1.572	1.527	1.526
Tar and its derivatives (including naphthalene):					
Tar burned by producers [1]	.427	.407	.328	.404	.336
Sold	.828	.850	.964	.848	.719
Total	3.841	3.847	3.842	3.610	3.324
Coke produced	12.749	12.956	12.447	12.640	12.253
Breeze produced	.308	.344	.345	.324	.328
Grand total	16.898	17.147	16.634	16.574	15.905

[1] Includes pitch-of-tar.

TABLE 46.—Percentage of coal costs recovered from the sale of coal-chemical materials in the United States

	1957–59 (average)	1960	1961	1962	1963
Product:					
Ammonia products	3.1	2.8	3.2	2.9	2.8
Light oil and its derivatives	6.9	7.5	6.7	5.5	5.0
Surplus gas used or sold	16.1	15.9	16.1	15.5	16.1
Tar and its derivatives used or sold (including naphthalene)	12.7	12.7	13.2	12.7	11.1
Total	38.8	38.9	39.2	36.6	35.0
Value of coal per short ton	$9.90	$9.89	$9.79	$9.85	$9.49

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COKE-OVEN GAS

Yields of gas vary with carbonizing temperatures and different coals carbonized, but an overall average of 10,470 cubic feet of gas was produced for each ton of coal carbonized in slot ovens in 1963. This was virtually the same yield as in 1962, and only slightly more than the average of the base years. Average yields of gas have been rather uniform during the past two decades, ranging between 10,150 and 10,700 cubic feet per ton of coal. Yields were substantially higher in the 1920's and 1930's, however, when coke-oven gas was in demand for residential and commercial heating and a large number of plants were operated for maximum gas recovery.

Tables 47 and 48 show the production, disposal, and distribution of coke-oven gas in 1963. Roughly, one-third of the production was used for heating coke ovens and the remainder, called surplus gas, was used by producers for firing boilers and a variety of other uses, and sold for industrial use or distribution through city mains. A small part of the production was wasted because storage facilities at most plants are limited and some gas was burned in the atmosphere when production exceeded demand.

TABLE 47.—Production and disposal of coke-oven gas in the United States in 1963, by States

(Thousand cubic feet)

State	Produced		Used in heating ovens	Surplus used or sold			Wasted
	Total	Per ton of coal coked		Quantity	Value		
					Total	Average	
Alabama	57,754,466	9.80	26,506,307	30,362,683	$4,251,487	$0.140	885,476
California, Colorado, Utah	43,450,931	11.30	14,636,994	28,647,641	5,770,785	.201	166,296
Connecticut, Maryland, New Jersey, New York	103,703,349	11.34	29,535,650	73,366,544	25,426,530	.347	801,155
Illinois	28,291,302	10.22	8,409,919	18,714,836	3,099,745	.166	1,166,547
Indiana	112,240,789	10.36	36,908,595	74,606,764	14,711,978	.197	725,430
Kentucky, Missouri, Tennessee, Texas	27,353,808	9.64	12,604,775	13,783,321	1,832,358	.133	965,712
Michigan	47,010,226	9.91	8,316,426	38,526,190	8,500,633	.221	167,610
Minnesota and Wisconsin	9,323,983	9.52	5,339,667	3,942,317	799,674	.203	41,999
Ohio	89,480,904	9.85	32,273,173	56,503,014	13,581,670	.240	704,717
Pennsylvania	232,043,173	10.60	89,965,065	141,231,367	30,138,721	.213	846,741
West Virginia	49,929,444	11.21	13,087,843	36,399,301	8,607,471	.236	442,300
Total 1963	800,582,375	10.47	277,584,414	516,083,978	116,721,052	.226	6,913,983
At merchant plants	72,286,946	9.12	33,711,239	37,820,661	10,532,562	.278	755,046
At furnace plants	728,295,429	10.62	243,873,175	478,263,317	106,188,490	.222	6,158,937
Total 1962	766,102,074	10.45	271,302,119	483,878,788	111,997,169	.231	10,921,167

Most slot ovens were heated with coke-oven gas which was recycled to the ovens after the chemical raw materials had been removed. Some plants, however, used other leaner gases (blast-furnace or producer gas) for underfiring, thereby making additional quantities of coke-oven gas, which has a higher calorific value, available for other uses or for sale. Table 49 shows the quantities of various gases used for heating coke ovens in 1963. Of the 334 billion cubic feet consumed, 83 percent was coke-oven gas; 16 percent was blast-furnace

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gas; and the remainder, natural gas, producer gas, and hydrogen-free coke-oven gas. All of the blast-furnace gas and spillage gas was used at furnace plants, and all producer gas was used at merchant plants.

Ninety-three percent of the total surplus coke-oven gas was produced at furnace plants. The bulk of this gas was used for firing boilers at coke plants or transferred to affiliated plants where it was

TABLE 48.—Surplus coke-oven gas used by producers in the United States and sold in 1963, by States

(Thousand cubic feet)

State	Used by producers—					
	Under boilers, etc.			In steel or allied plants		
	Quantity	Value		Quantity	Value	
		Total	Average		Total	Average
Alabama	13,255,203	$1,881,772	$0.142	13,756,804	$1,940,299	$0.141
California, Colorado, Utah	(1)	(1)	(1)	(1)	(1)	(1)
Connecticut, Maryland, New Jersey, New York	(1)	(1)	(1)	59,021,596	18,548,675	.314
Illinois	(1)	(1)	(1)	11,907,976	2,013,601	.169
Indiana	10,741,998	2,177,764	.203	61,025,782	11,276,890	.185
Kentucky, Missouri, Tennessee, Texas	4,879,466	586,474	.120	(1)	(1)	(1)
Michigan	(1)	(1)	(1)	31,999,274	6,893,518	.215
Minnesota and Wisconsin	(1)	(1)	(1)	(1)	(1)	(1)
Ohio	7,729,090	1,842,430	.238	42,816,653	10,674,337	.249
Pennsylvania	21,877,667	4,443,934	.203	115,610,845	24,942,411	.216
West Virginia	(1)	(1)	(1)	(1)	(1)	(1)
Undistributed	21,566,164	4,730,000	.219	54,203,974	12,006,474	.222
Total 1963	80,049,588	15,662,374	.196	390,342,904	88,296,205	.226
At merchant plants	7,075,340	1,139,382	.161	2,947,699	672,412	.228
At furnace plants	72,974,248	14,522,992	.199	387,395,205	87,623,793	.226
Total 1962	73,394,692	14,697,527	.200	363,086,894	83,250,385	.229

State	Sold					
	Distributed through city mains			For industrial use		
	Quantity	Value		Quantity	Value	
		Total	Average		Total	Average
Alabama	(1)	(1)	(1)	(1)	(1)	(1)
California, Colorado, Utah				(1)	(1)	(1)
Connecticut, Maryland, New Jersey, New York	13,954,433	$6,769,387	$0.485	(1)	(1)	(1)
Illinois				(1)	(1)	(1)
Indiana	(1)	(1)	(1)	(1)	(1)	(1)
Kentucky, Missouri, Tennessee, Texas	(1)	(1)	(1)	(1)	(1)	(1)
Michigan				(1)	(1)	(1)
Minnesota and Wisconsin				(1)	(1)	(1)
Ohio				5,957,271	$1,064,903	$0.179
Pennsylvania	(1)	(1)	(1)	(1)	(1)	(1)
West Virginia				(1)	(1)	(1)
Undistributed	6,854,356	1,902,480	.278	18,925,426	3,025,703	.160
Total 1963	20,808,789	8,671,867	.417	24,882,697	4,090,606	.164
At merchant plants	13,368,045	6,233,807	.466	14,429,577	2,486,961	.172
At furnace plants	7,440,744	2,438,060	.328	10,453,120	1,603,645	.153
Total 1962	22,699,500	9,747,274	.429	24,697,702	4,301,983	.174

[1] Included with "Undistributed" to avoid disclosing individual company data.

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used for heating open-hearth furnaces and various other steel-plant uses. Merchant plants used only about one-fourth of their supply of surplus gas and sold the remainder. Merchant sales were distributed about equally to city mains and industrial plants.

Two oven-coke plants processed coke-oven gas to recover hydrogen which was used for producing synthetic ammonia. The quantity of gas used for this purpose could not be shown as there were less than three companies that used gas in this manner. This quantity is included, however, in the amount used by producers in steel or allied plants.

TABLE 49.—Coke-oven gas and other gases used in heating coke ovens in the United States in 1963, by States [1]

(Thousand cubic feet)

State	Coke-oven gas	Producer gas	Blast-furnace gas	Natural gas	Other gases [2]	Total coke-oven gas equivalent
Alabama	26, 506, 307			38, 314		26, 544, 621
California, Colorado, Utah	14, 636, 994		5, 135, 282	28, 623	55, 222	19, 856, 121
Connecticut, Maryland, New Jersey, New York	29, 535, 650	1, 398, 138	8, 984, 145	1, 491, 016		41, 408, 949
Illinois	8, 409, 919		4, 135, 102			12, 545, 021
Indiana	36, 908, 595		8, 437, 598	493, 642		45, 839, 835
Kentucky, Missouri, Tennessee, Texas	12, 604, 775					12, 604, 775
Michigan	8, 316, 426		12, 700, 778			21, 017, 204
Minnesota and Wisconsin	5, 339, 667					5, 339, 667
Ohio	32, 273, 173		5, 007, 437			37, 280, 610
Pennsylvania	89, 965, 065		2, 102, 254	184, 404		92, 251, 723
West Virginia	13, 087, 843		6, 255, 473			19 343 316
Total 1963	277, 584, 414	1, 398, 138	52, 758, 069	2, 235, 999	55, 222	334, 031, 842
At merchant plants	33, 711, 239	1, 398, 138		463, 150		35, 572, 527
At furnace plants	243, 873, 175		52, 758, 069	1, 772, 849	55, 222	298, 459, 315
Total 1962	271, 302, 119	1, 559, 854	47, 819, 143	2, 710, 149	754, 341	324, 145, 606

[1] Adjusted to an equivalent of 550 Btu per cubic foot.
[2] Hydrogen-free coke-oven gas (spillage gas).

COKE-OVEN AMMONIA

Ammonia is recovered at oven-coke plants as an aqueous solution called ammonia liquor, or it is reacted with sulfuric or phosphoric acid to produce ammonium sulfate, diammonium phosphate, or monoammonium phosphate. Most plants produce ammonium sulfate, and 86 percent of the 185,300 tons of ammonia recovered was in sulfate form. Six percent was converted into diammonium or monoammonium phosphate, and 8 percent was recovered as ammonia liquor. Of the 59 plants that produced ammonia products, 45 produced ammonium sulfate; 9 made ammonia liquor; 3 made diammonium or monoammonium phosphate; 1 produced both liquor and sulfate; and 1 produced sulfate and phosphate.

Table 50 shows the production and sales of ammonia products in 1963, and the yield of ammonia in terms of sulfate equivalent. Approximately the same percentages of each product were recovered as in 1962, but the output of ammonium sulfate and diammonium and monoammonium phosphate increased 7 percent, while ammonia liquor production was 8 percent higher than in the previous year. These increases were due in part to the larger quantity of coal car-

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bonized in 1963. But the yield of ammonia also increased, and approximately 0.15 additional pounds of ammonia (0.58 pounds of sulfate equivalent) was recovered from each ton of coal carbonized. The average yield of ammonia for the year, in sulfate equivalent, was 19.23 pounds per ton of coal carbonized. This yield was 3 percent higher than in 1962 but was slightly less than the average yield of 19.39 recorded in 1957–59.

TABLE 50.—Coke-oven ammonia produced in the United States and sold in 1963, by States

(Short tons)

State	Active plants [1]	Produced				Sold [7]				On hand Dec. 31	
		Sulfate equivalent	Pounds per ton of coal coked	As sulfate [2]	As liquor (NH_3 content)	As sulfate [2]		As liquor (NH_3 content)		Sulfate [2]	Liquor (NH_3 content)
						Quantity	Value	Quantity	Value		
Alabama	7	59,914	20.33	59,487	(3)	63,807	$1,830,073	(3)	(3)	12,898	21
California, Colorado, Utah [4]	3	42,947	22.34	42,947		42,120	2,833,470			9,097	
Connecticut, Maryland, New Jersey, New York [5]	6	91,844	20.10	88,745	(3)	90,762	2,684,188	(3)	(3)	10,754	132
Illinois	4	29,691	22.31	29,691		29,754	898,063			2,158	
Indiana	5	97,961	18.08	83,651	(3)	88,909	2,172,835	(3)	(3)	12,096	497
Kentucky, Tennessee, Texas	3	21,084	18.96	(3)	(3)	(3)	(3)	(3)	(3)	537	365
Michigan [4]	4	36,804	15.52	(3)	(3)	(3)	(3)	(3)	(3)	4,225	36
Minnesota and Wisconsin	2	4,135	10.78	(3)	(3)	(3)	(3)	(3)	(3)	342	81
Ohio	10	80,380	18.70	66,847	(3)	73,280	1,916,803	(3)	(3)	8,292	743
Pennsylvania	12	212,246	19.51	212,246		193,338	4,616,074			54,593	
West Virginia	3	41,772	19.39	41,772		42,003	967,479			5,258	
Undistributed				36,518	14,662	38,085	1,791,970	12,697	$906,247		
Total 1963	59	718,778	19.23	[6] 661,904	14,662	[8] 662,058	19,710,955	12,697	906,247	120,250	1,875
At merchant plants	14	69,701	19.17	25,962	11,276	26,798	1,110,740	9,692	716,539	5,179	1,418
At furnace plants	45	649,077	19.23	635,942	3,386	635,260	18,600,215	3,005	189,708	115,071	457
Total 1962	61	670,630	18.65	617,965	13,577	683,786	20,065,315	12,897	927,152	120,343	1,204

[1] Number of plants that recovered ammonia.
[2] Includes diammonium and monoammonium phosphate.
[3] Included with "Undistributed" to avoid disclosing individual company data.
[4] Figures include diammonium phosphate.
[5] Figures include monoammonium phosphate.
[6] Comprises 619,680 tons of ammonium sulfate and 42,224 tons of diammonium and monoammonium phosphate.
[7] Includes 36,689 tons of ammonium sulfate and diammonium phosphate valued at $833,631 exported.
[8] Comprises 621,576 tons of ammonium sulfate valued at $15,904,898 and 40,482 tons of diammonium and monoammonium phosphate valued at $3,806,057.

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Most of the ammonium sulfate and virtually all diammonium and monoammonium phosphate produced at coke plants was sold for use as fertilizer for agricultural purposes. Some ammonia liquor is used also in agriculture, and some is used for producing a variety of other products such as ammonium chloride, sulfuric acid, and household ammonia. Exact data on end uses of ammonia products produced at coke plants are not available, however.

Approximately the same quantities of products were sold as were produced, and stocks at the end of the year were at about the same level as when the year began. The average value of the products sold, f.o.b. plant, declined, however. Ammonium sulfate decreased $0.97 per ton to $25.59; ammonia liquor declined $0.51 per ton to $71.38; and diammonium and monoammonium phosphate decreased $5.91 per ton to $94.02.

CRUDE COAL TAR AND DERIVATIVES

Crude coal tar is a complex mixture of organic compounds that are condensed from the gas after it leaves the ovens. The bulk of the tar is recovered in collecting mains where the gas is cooled by spraying with ammonia liquor; most of the remainder is recovered from the primary coolers where the gas undergoes further cooling.

Table 51 shows the quantities of tar produced, used by producers for various purposes, and sold by producers for refining in 1963. Tar is produced at all oven-coke plants, and the quantities recovered represent, roughly, from 4 to 5 percent of the weight of the coals carbonized. Recovery yields differ widely among plants, however, depending upon the rank and grade of the coals used, oven temperatures, and other operating factors.

Yields at individual plants for the year varied from 4 to 11 gallons per ton of coal carbonized, but the average yield for all plants was 8.78 gallons. Yields were highest in West Virginia, several western States, and Pennsylvania, principally because larger percentages of higher-volatile coals were used. The lowest average yield was recorded for Minnesota and Wisconsin where a large part of their coke output was foundry coke which required higher percentages of low-volatile bituminous coals as well as additions of anthracite.

Fifty-seven percent of the tar produced was used by producers, and the remainder was sold to tar refining plants. Most of the tar used by producers was produced by furnace plants who retained about 60 percent of their output. Merchant plants sold virtually all of their production because these plants generally are small and cannot profitably process their tar.

Of the total tar produced, 91 million gallons, or 14 percent of the total, was used by producers as fuel. This was nearly double the quantity used as fuel in 1962, because several plants with refining facilities were being modernized in 1963 and burned the tar.

Forty-three percent of the tar produced was partially refined or topped by producers. This is a process in which the low-boiling distillate fraction consisting principally of tar acids, bases, and naphthalene is stripped from the crude tar. The residue, known as soft pitch, usually is burned as fuel. Furnace plants find this method especially attractive because they can sell the distillate to tar re-

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finers and retain the pitch which is used principally as fuel in open-hearth furnaces.

The principal tar derivatives recovered at coke plants were crude chemical oil, creosote oil, naphthalene, and pitch. Smaller quantities of phenol, cresols, cresylic acid, and pyridine also were produced. Most of the plants topped their tar and recovered only crude chemical oil and a refined tar or soft pitch. A few plants distilled tar at higher temperatures and produced creosote oil, naphthalene, hard pitch, and a number of other tar derivatives. Statistics on these products could not be shown because the figures would disclose individual company data. These data, however, were transmitted to the U.S. Tariff Commission which combined them with similar figures collected from tar distillers and petroleum refiners and published combined totals on the various products in monthly and annual reports on synthetic organic chemicals.

TABLE 51.—Coke-oven tar produced in the United States, used by producers, and sold in 1963, by States

(Gallons)

State	Produced		Used by producers—		
	Total	Per ton of coal coked	For refining or topping	As fuel	Otherwise
Alabama	39,670,129	6.73	14,795,622		
California, Colorado, Utah	39,771,638	10.34	4,971,708	17,669,506	24,002
Connecticut, Maryland, New Jersey, New York	85,189,476	9.32	50,139,106	18,320,551	169,159
Illinois	21,627,866	7.60			
Indiana	90,747,295	8.37	36,383,401	11,505,866	
Kentucky, Missouri, Tennessee, Texas	19,939,631	7.03			35,250
Michigan	34,367,334	7.25		7,208,714	4,500
Minnesota and Wisconsin	5,815,327	5.94			5,650
Ohio	80,955,138	8.91	7,797,965	21,145,520	48,260
Pennsylvania	209,429,966	9.56	143,515,304	14,543,937	270,967
West Virginia	44,961,828	10.10	31,965,445	919,076	
Total 1963	671,875,628	8.78	289,568,551	91,313,170	557,788
At merchant plants	50,483,803	6.37	645,818		34,700
At furnace plants	621,391,825	9.06	288,922,733	91,313,170	523,088
Total 1962	650,111,702	8.86	306,136,981	46,373,208	541,245

State	Sold for refining into tar products [1]			On hand Dec. 31
	Quantity	Value		
		Total	Average	
Alabama	25,109,885	$2,977,524	$0.119	3,202,156
California, Colorado, Utah	17,361,556	2,001,331	.115	1,717,874
Connecticut, Maryland, New Jersey, New York	16,723,004	1,724,769	.103	4,169,068
Illinois	20,551,017	2,082,969	.101	1,291,364
Indiana	43,349,763	4,583,347	.106	3,264,540
Kentucky, Missouri, Tennessee, Texas	19,880,552	2,189,853	.110	354,040
Michigan	27,504,159	2,939,302	.107	1,704,681
Minnesota and Wisconsin	5,854,052	649,590	.111	826,216
Ohio	51,862,409	5,510,534	.106	4,460,964
Pennsylvania	50,576,131	5,179,503	.102	12,653,881
West Virginia	11,925,827	1,272,187	.107	1,315,898
Total 1963	290,698,355	31,110,909	.107	34,960,682
At merchant plants	50,221,691	5,428,215	.108	2,197,575
At furnace plants	240,476,664	25,682,694	.107	32,763,107
Total 1962	303,885,750	36,646,318	.121	34,496,025

[1] Comprises 28,081,874 gallons valued at $3,031,795 sold to affiliated companies and 262,616,481 gallons valued at $28,079,114 sold to other purchasers. Also includes small amount exported.

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Although tar production increased in 1963, 5 percent less tar was refined or topped by producers, and output of tar derivatives at coke plants decreased accordingly. Production of both crude chemical oil and soft pitch declined, but more tar was refined at higher temperatures, and the output of creosote oil and hard pitch increased. The bulk of the pitch was burned as fuel, but demand for a number of products made from pitch (pipe-coating enamel, roofing material, fiber-pipe, carbon electrode binder) has increased in recent years, and the quantity of pitch sold in 1963 was 48 percent greater than in the previous year. A total of 324,000 tons of pitch, valued at $8.6 million was sold in 1963.

The total value of tar and tar derivatives used and sold was $80.7 million. This 12-percent decrease from the value in 1962 was due principally to a $0.014 per gallon decrease in the price of crude tar.

CRUDE LIGHT OIL AND DERIVATIVES

Virtually all light oil in the United States is recovered from coke-oven gas by an absorption process in which the gas is sprayed with a higher-boiling petroleum wash oil as it is channeled through absorption towers. After absorption, light oil is separated from the wash oil by direct-steam distillation.

Roughly, 3 gallons (1 percent of the weight of the coal) of light oil are recovered per ton of coal carbonized. Yields varied with the kind of coals carbonized and with operating conditions and ranged from an average of 2.34 gallons for plants in Alabama to a combined average of 3.52 gallons for plants in California, Colorado, and Utah. The average yield for all plants was 2.91, a 1-percent decrease from 1962 but virtually the same yield as for 1957–59.

All but five of the active plants recovered light oil, and total production increased 3 percent. The quantity of light oil refined by producers, however, decreased 2 percent. A significant change has occurred in recent years in the amounts of light oil processed by producers and the amounts sold. For many years about 95 percent of the production was refined at plants where it was produced, or transferred to affiliated plants that processed it with their own production. Since about 1957, however, increasingly larger quantities have been sold, and in 1963 only 85 percent of the production was refined by producers. The principal cause for the increase in light-oil sales is that some coke producers with existing refining facilities can not meet the more exact benzene specifications required in certain applications. Table 52 shows the crude light oil produced and refined by producers and the derived products produced and sold in 1963.

The principal products derived from light oil at coke plants are benzene, toluene, xylene, and solvent naphtha. All are recovered by fractional distillation, and 42 of the 59 active plants produced one or more of these products. A number of plants that did not refine light oil shipped their production to affiliated plants for distillation.

Table 53 shows the yield of various products from the refining of crude light oil. As with other coal-chemical materials, yields vary, but approximately 85 percent of the light oil processed was recovered as saleable products. The average yield of benzene, the principal derivative, was 62.1 for 1963, while the toluene yield was 13.9; xylene

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was 3.7; solvent naphtha, 1.9; and other products, 2.4. Benzene, recovered in four grades according to purity, was sold for use as motor fuel and as a basic chemical material that subsequently was converted into a number of intermediate organic chemicals such as phenol, styrene, and aniline. The intermediate chemicals in turn were used to manufacture such products as synthetic rubber and fibers, plastics, explosives, dyes, pharmaceuticals, and many other end products. The Bureau of Mines does not collect data on the consumption and uses of benzene, but estimates are published annually by the Coal-Chemicals Committee of the American Coke and Coal Chemicals Institute. These data, covering the past four years and 1957–59, are shown in table 56.

Table 54 shows the quantities of the various grades of benzene and toluene produced, and table 55 shows the principal light-oil derivatives produced and sold. Compared with 1962, production and sales of all products decreased. Although yields of all products except benzene declined, the decreases in production were due principally to the 2-percent decrease in the quantity of light oil refined at coke plants.

TABLE 52.—Coke-oven crude light oil produced in the United States and derived products produced and sold in 1963, by States

(Gallons)

State	Active plants [1]	Crude light oil				Derived products		
		Produced	Per ton of coal coked	Refined on premises [2]	On hand Dec. 31	Produced	Sold [3]	
							Quantity	Value
Alabama	7	13,773,266	2.34	13,420,252	614,643	10,776,027	10,483,943	$2,135,812
California, Colorado, Utah	3	13,553,621	3.52	13,392,951	198,583	10,917,989	9,719,509	2,013,121
Connecticut, Maryland, New Jersey, New York	6	29,317,242	3.21	28,204,475	579,166	23,458,611	22,894,225	4,997,931
Illinois	4	8,102,907	3.04	5,760,237	191,894	4,560,889	4,524,838	959,954
Indiana	4	28,071,372	2.72	27,425,973	210,849	21,497,126	20,803,405	4,343,855
Kentucky, Missouri, Tennessee, Texas	5	7,040,678	2.48	2,959,618	184,660	2,478,911	2,479,009	482,491
Michigan and Wisconsin	5	13,314,865	2.67	8,036,078	316,936	6,822,954	6,755,947	1,470,352
Ohio	10	25,490,026	2.88	18,311,644	349,508	15,837,822	16,163,016	3,219,493
Pennsylvania	12	65,589,198	3.00	61,875,070	1,561,730	53,914,621	50,947,358	11,315,043
West Virginia	3	13,912,532	3.12	6,408,578	472,806	5,745,503	6,226,120	1,242,415
Total 1963	59	218,165,707	2.91	185,794,876	4,680,775	156,010,453	150,997,370	32,180,467
At merchant plants	13	15,014,209	2.23	10,122,168	885,926	8,598,872	8,689,439	1,815,250
At furnace plants	46	203,151,498	2.98	175,672,708	3,794,849	147,411,581	142,307,931	30,365,217
Total 1962	61	211,687,939	2.94	188,952,363	4,833,467	159,338,846	159,696,292	36,002,083

[1] Number of plants that recovered crude light oil.
[2] Includes small quantity of material also reported in sales of crude light oil in table 43.
[3] Excludes 32,610,305 gallons of crude light oil valued at $3,632,984 sold as such.

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Of significance in 1963 was the continued decline in prices of light-oil derivatives, particularly xylene and solvent naphtha. During the year the selling price of benzene and toluene derived from light oil each declined $0.01 per gallon, and the average value per gallon, as reported by producers, was $0.22 and $0.20, respectively. Solvent naphtha declined $0.03 per gallon to $0.21, and xylene decreased $0.02 to $0.24.

TABLE 53.—Yield of light-oil derivatives from refining crude light oil at oven-coke plants in the United States

(Percent)

Year	Benzene		Toluene (all grades)	Xylene (all grades)	Solvent naphtha (crude and refined)	Other light-oil products
	Motor	All other grades				
1929	54.4	12.8	9.4	(1)	3.7	3.4
1939	48.6	15.4	12.1	2.5	2.9	3.8
1949	9.5	55.6	12.5	3.3	2.3	3.2
1957-59 (average)	.5	60.4	13.5	3.9	2.1	2.3
1960	.4	62.0	13.9	3.7	2.1	1.7
1961	.5	60.5	14.3	3.8	2.3	1.8
1962	.9	60.5	14.4	4.0	2.3	2.2
1963	1.6	60.5	13.9	3.7	1.9	2.4

[1] Included with "Solvent naphtha (crude and refined)."

TABLE 54.—Benzene and toluene produced at oven-coke plants in the United States, by grades

(Gallons)

Year	Benzene				Toluene		
	Motor	Nitration (1° C)	Industrial (2° C)	All other	Nitration (1° C)	Industrial (2° C)	All other
1941	106,372,000	15,414,500	18,286,400	4,182,600	14,689,800	13,268,500	1,378,900
1949	20,923,700	28,988,700	91,717,300	2,035,600	20,808,300	6,317,200	545,100
1957-59 (average)	1,240,500	83,881,700	50,045,700	5,193,600	24,810,700	6,196,400	(1)
1960	769,900	100,907,000	32,536,800	1,882,600	24,129,300	6,269,200	(1)
1961	1,027,400	85,648,800	33,111,900	1,444,600	22,820,100	5,586,700	(1)
1962	1,786,200	81,831,600	32,062,800	332,800	22,140,900	5,089,800	(1)
1963	2,907,000	78,071,800	33,699,700	655,900	20,514,100	5,280,300	(1)

[1] Included with "Industrial (2° C)" to avoid disclosing individual company data.

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TABLE 55.—Light-oil derivatives produced at oven-coke plants in the United States and sold in 1963, by States

(Gallons)

State	Benzene (all grades except Motor)				Toluene (all grades)			
	Produced	Yield from crude light oil refined (percent)	Sold		Produced	Yield from crude light oil refined (percent)	Sold	
			Quantity	Value			Quantity	Value
Alabama	7,991,034	59.5	7,762,273	$1,642,087	1,719,410	12.8	1,653,465	$294,355
California, Colorado, Utah	7,228,025	54.0	6,264,829	1,200,664	1,596,280	11.9	1,449,704	335,104
Illinois	3,447,535	59.9	3,371,358	748,251	786,268	13.6	809,766	159,466
Indiana	17,633,356	64.3	17,320,504	3,715,683	3,113,721	11.4	2,963,580	538,140
Maryland and New York	17,625,757	62.5	17,119,698	3,911,283	4,035,186	14.3	3,966,743	758,331
Michigan and Wisconsin	5,801,515	72.2	5,680,282	1,273,064	777,386	9.7	790,980	154,396
Missouri, Tennessee, Texas, West Virginia	5,910,712	63.1	6,536,044	1,291,961	1,452,853	15.5	1,407,884	280,539
Ohio	10,156,927	55.5	10,637,223	2,196,139	2,790,249	15.2	2,798,566	572,934
Pennsylvania	36,632,549	59.2	35,507,831	8,212,882	9,523,066	15.4	8,984,951	1,755,978
Total 1963	112,427,410	60.5	110,200,042	24,192,014	25,794,419	13.9	24,825,639	4,849,243
At merchant plants	5,797,426	57.3	5,769,119	1,306,369	1,566,577	15.5	1,627,251	334,097
At furnace plants	106,629,984	60.7	104,430,923	22,885,645	24,227,842	13.8	23,198,388	4,515,146
Total 1962	114,227,183	60.5	116,409,505	26,871,599	27,230,734	14.4	27,373,766	5,578,346

State	Xylene (all grades)				Solvent naphtha (crude and refined)			
	Produced	Yield from crude light oil refined (percent)	Sold		Produced	Yield from crude light oil refined (percent)	Sold	
			Quantity	Value			Quantity	Value
Alabama	480,140	3.6	573,527	$142,759	136,238	1.0	85,990	$17,247
California, Colorado, Utah	390,722	2.9	332,136	87,558	464,732	3.5	434,610	105,370
Illinois	130,135	2.3	142,763	33,441	(1)	(1)	(1)	(1)
Indiana	298,644	1.1	308,920	69,123	124,877	0.3	49,237	13,488
Maryland and New York	1,050,010	3.7	1,069,514	264,638	(2)	(2)	(2)	(2)
Michigan and Wisconsin	138,679	1.7	164,323	36,244	(1)	(1)	----------	----------
Missouri, Tennessee, Texas, West Virginia	485,262	5.2	474,610	114,300	81,582	0.9	85,661	13,688
Ohio	747,997	4.1	741,798	193,800	534,150	2.9	531,266	95,473
Pennsylvania	3,166,731	5.1	3,315,936	752,029	2,219,374	2.5	2,172,626	467,708
Total 1963	6,888,320	3.7	7,123,527	1,693,892	3,560,953	1.9	3,359,390	712,974
At merchant plants	373,974	3.7	403,831	100,281	30,235	0.3	31,488	6,679
At furnace plants	6,514,346	3.7	6,719,696	1,593,611	3,530,718	2.0	3,327,902	706,295
Total 1962	7,577,883	4.0	7,196,906	1,831,088	4,283,995	2.3	4,304,452	1,042,776

[1] Included with Indiana.
[2] Included with Pennsylvania.

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TABLE 56.—Estimated consumption of commercial benzene (excluding Motor grade) in the United States, by uses [1]

(Thousand gallons)

	1957–59 (average)	1960	1961	1962	1963
Styrene	160,000	210,000	210,000	[2] 224,000	248,000
Phenol (synthetic)	74,000	100,000	100,000	[2] 106,000	117,000
Dodecyl benzene	36,000	37,000	37,000	40,000	36,000
Cyclohexane	30,000	40,000	55,000	65,000	80,000
Aniline	14,000	15,000	16,000	17,000	19,000
DDT	14,000	16,000	16,000	16,000	17,000
Dichlorobenzene and Monochlorobenzene	11,000	15,000	15,000	16,000	17,000
Maleic anhydride	9,000	17,000	14,000	[2] 15,000	16,000
Benzene hexachloride	3,000	3,000	2,000	1,000	1,000
Diphenyls	4,500	4,500	5,000	5,000	5,000
Nitrobenzene	2,000	2,000	2,000	2,000	2,000
Miscellaneous	21,500	9,000	9,000	17,000	20,000
Exported	7,000	23,500	46,000	[2] 41,000	65,000
Total	386,000	492,000	527,000	565,000	643,000

[1] Coal-Chemicals Committee, American Coke and Coal-Chemicals Institute, Washington, D.C.
[2] Revised figure.

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Fuel Briquets and Packaged Fuel

By Eugene T. Sheridan [1]

Contents

	Page		Page
General summary	289	Fuel briquets—Continued	
Scope of report	290	Technology	299
Fuel briquets	292	Packaged fuel	300
Capacity	292	Capacity	300
Production	293	Production	301
Raw materials	294	Raw materials	301
Shipments	295	Shipments	302
Value and price	296	Value and price	303
Foreign trade	297	World review	303

GENERAL SUMMARY

PRODUCTION of fuel briquets and packaged fuel continued to decline in 1963, and the combined output of both fuels was 4 percent less than in 1962. Briquet production decreased 18,816 short tons, a decline of 3 percent, and packaged fuel output dropped 3,224 short tons, an 18-percent decrease. The smaller output of both fuels continued the steady downward trend in production by these industries that began shortly after World War II when natural gas and fuel oil began replacing solid fuels for residential heating.

Eleven briquet plants with a total maximum productive capacity of 2.3 million tons produced 551,000 tons of fuel briquets. Thirteen packaged-fuel plants with a combined maximum annual productive capacity of 113,000 tons produced 14,000 tons of packaged fuel. All plants in both industries operated at reduced rates.

West Virginia was the principal briquet producer, but more than one-half of the fuel briquets was produced in Indiana, Michigan, and Wisconsin. Michigan and Wisconsin were the chief producers of packaged fuel.

Briquets were distributed in 40 States and the District of Columbia, and exported to 14 foreign countries. Exports increased substantially over those of 1962. Imports decreased 45 percent but were nearly 12 times the level of the base years, 1957–59. There was no foreign trade in packaged fuel.

The total value of shipments was $8.5 million—$8.2 million for briquets and $340,000 for packaged fuel. Briquets were sold at an average value of $14.88 per ton, f.o.b. plant, and packaged fuel was sold for $23.36 per ton, f.o.b. plant.

[1] Supervisory mineral specialist.

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Salient statistics on the fuel-briquet and packaged-fuel industries are shown in table 1.

SCOPE OF REPORT

This report, part of an annual Bureau of Mines publication on the mineral industries of the United States, is based upon data submitted voluntarily by producers of fuel briquets and packaged fuel. Similar reports on the fuel-briquet industry have been published each year since 1907, except in 1910 when no data were collected. A report on the packaged-fuel industry has been published annually since 1935.

Except where noted, all data were compiled from reports by producers. Charcoal briquets are not included because they are forest products and not considered within the scope of the Bureau's commodity programs.

Complete coverage of both industries was attempted and all known producers were canvassed. Of the 12 briquet plants surveyed, 11 reported production and 1, inactive in 1962, was abandoned. One plant in Missouri changed ownership—the Kansas City briquet plant of Truax-Traer Coal Co. was sold to Vanco Coal and Material Co.

Nineteen packaged-fuel plants were canvassed and 13 reported production, 4 were abandoned, and 2 did not reply. Two of the abandoned plants operated in 1962, but their production was negligible. The plants that did not reply did not respond in 1962, and in all probability have been abandoned.

Fuel briquets and packaged fuel are processed fuels of mineral origin. The two fuels are similar in that both are prepared from fine-sized, solid fuels that are mixed with a binding material and compacted with heat and pressure. They differ, however, in physical properties and manner of use. Briquets generally are produced in pillow-shaped forms, 2 to 4 inches long; made with a water insoluble binder; and handled and used as bulk solid fuel, chiefly for cooking and residential heating. Packaged fuel is produced as 3- or 4-inch cubes, six or eight of which are wrapped together in heavy paper to form a package that is burned as a unit. Although packaged fuel is used principally for space heating, it is a specialty fuel, used largely to supplement other fuels in the months preceding and following the regular heating season. Briquet plants are relatively large and usually are located at mines or coal-unloading docks. Most packaged-fuel plants are small and operate in conjunction with coal yards. A few, however, are relatively large, and these plants account for the major part of the packaged-fuel output.

Data on production and shipments of briquets are shown by geographic regions, arbitrarily established, to avoid revealing individual plant data in States with less than three producers. States in each region are as follows: Eastern—West Virginia; central—Indiana, Michigan, and Wisconsin; western—Missouri and North Dakota.

No information on stocks was collected because briquets and packaged fuel usually are sold as produced.

The term "capacity" in this report refers to the total maximum quantity of fuel that each industry could produce if all active plants,

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TABLE 1.—Salient fuel-briquet and packaged-fuel statistics

	1957–59 (average)	1960	1961	1962	1963
Fuel briquets:					
United States:					
Production.....short tons..	1,002,054	744,385	572,264	570,023	551,207
Shipments [1].....do....	999,444	744,934	567,779	569,913	551,459
Value of shipments.....	$13,471,783	$10,439,097	$7,956,102	$8,597,021	$8,207,989
Average per ton, f.o.b. plant...	$13.48	$14.01	$14.01	$15.08	$14.88
Imports.....short tons..	406	5,529	7,338	8,396	4,620
Exports.....do....	58,294	21,126	12,731	18,596	[2] 12,380
Consumption, apparent [3].....do....	941,556	729,337	562,386	559,713	543,699
World production.....do....	117,000,000	[4] 119,400,000	[4] 124,600,000	[4] 130,500,000	134,000,000
Packaged fuel:					
United States:					
Production.....do....	38,923	24,706	19,180	17,439	14,215
Shipments.....	38,432	24,940	19,005	17,259	14,555
Value of shipments.....	$868,112	$584,956	$441,497	$394,065	$340,021
Average per ton, f.o.b. plant...	$22.59	$23.45	$23.23	$22.83	$23.36

[1] Includes briquets used by producers.
[2] As reported by the Bureau of the Census. This figure differs from the total reported by producing companies (shown in table 7) to the Bureau of Mines.
[3] Shipments plus imports minus exports. Import and export data do not include briquets made from petroleum products.
[4] Revised figure.

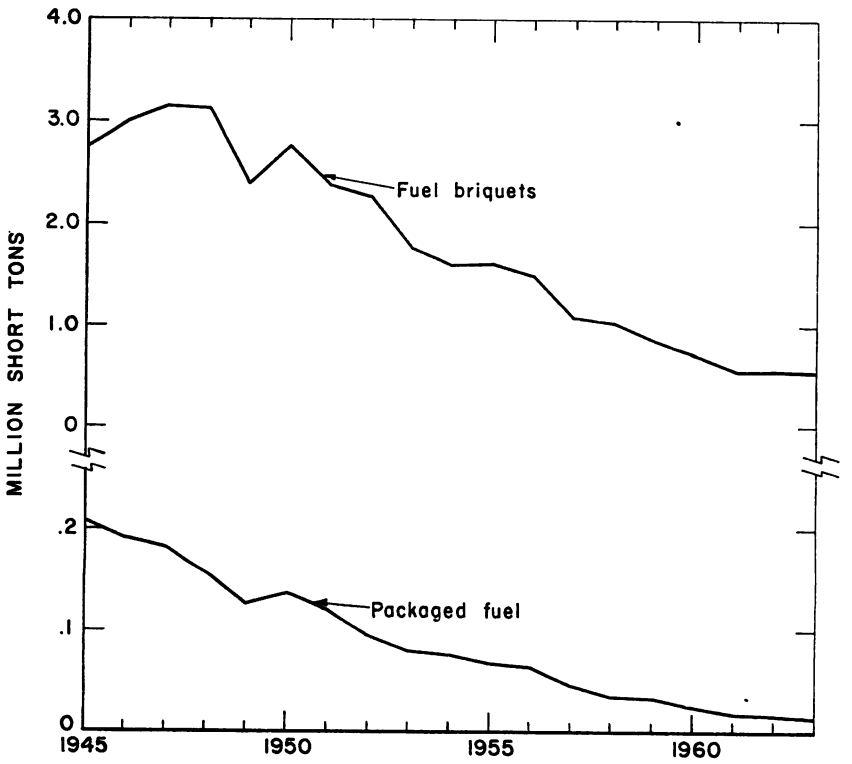

FIGURE 1.—Production of fuel briquets and packaged fuel in the United States, 1945–63.

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working their regular number of shifts each day but allowing for unavoidable shutdowns, operated at a maximum rate for a year. The quantities shown include only plants that reported production for 1963. These plants, however, account for virtually the entire capacity of both industries.

The terms "consumption" and "distribution" were used synonymously because it was assumed that, with the exception of the briquets exported, the fuels were consumed in the States to which shipped by producers.

FUEL BRIQUETS

CAPACITY

All briquet plants that operated in 1962 were in operation in 1963, and the productive capacity of the industry remained at virtually the level of the previous year. One plant changed hands during the year, however, and the new operator reported a slightly higher capacity. Plant capacities ranged from 45,000 to 600,000 tons per year, but nearly one-half of the plants had capacities of 100,000 tons or less. The total capacity of the industry was 2.3 million tons, about three-fourths that of the base years 1957–59 and, roughly one-half the capacity of a decade ago.

Data on the annual capacity of fuel-briquet plants are shown in table 2.

TABLE 2.—Annual capacity and production of fuel-briquet plants in the United States

	Active plants	Annual capacity (short tons)	Production	
			Short tons	Percent of capacity
1959	15	2,955,500	866,120	29.3
1960	14	2,624,500	744,385	28.4
1961	12	2,344,500	572,264	24.4
1962	11	2,307,500	570,023	24.7
1963:				
Plants with capacity of—				
Less than 25,000 tons				
25,000 to less than 100,000 tons	3	180,000	22,119	12.3
100,000 to less than 200,000 tons	4	647,500	186,861	28.9
200,000 to less than 400,000 tons	1	[1]	[1]	[1]
400,000 or more tons	3	1,500,000	342,227	22.8
Total	11	2,327,500	551,207	23.7
Plants with production of—				
Less than 5,000 tons	2	[2]	[2]	[2]
5,000 to less than 10,000 tons				
10,000 to less than 25,000 tons	4	580,000	78,296	13.5
25,000 to less than 100,000 tons	4	1,747,500	472,911	27.1
100,000 or more tons	1	[3]	[3]	[3]
Total	11	2,327,500	551,207	23.7

[1] Combined with "100,000 to less than 200,000 tons" to avoid disclosing individual company data.
[2] Combined with "10,000 to less than 25,000 tons" to avoid disclosing individual company data.
[3] Combined with "25,000 to less than 100,000 tons" to avoid disclosing individual company data.

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PRODUCTION

Eight plants reported decreases in production in 1963, but the loss in total output was nearly offset by the increased production of three other plants. Total production was 551,207 tons, a 3-percent decrease from 1962. Annual output, currently, is about one-half as large as in the base years, 1957–59, and less than one-fifth that of 1947, the year of peak production. The decline in output in 1963 continued a trend that began in 1948 as fuel oil and natural gas moved into heating markets formerly held by solid fuels.

Eleven briquet plants in six States were in operation. West Virginia, with one plant, was the largest producer. Wisconsin had five plants and ranked second in output. The combined production of these two States was, roughly, three-fourths of the total. Other producing States and the number of active plants in each, in order of output were: Michigan, one; Missouri, two; and North Dakota and Indiana, one each.

Because briquets are used chiefly for space heating and are sold as produced, production was seasonal; monthly output ranged from 93,000 tons in January to less than 12,000 tons in July. Total output of the industry, in terms of maximum productive capacity, was only 23.7 percent.

The quantity of briquets produced and sold, production by months, the value of shipments, and the number of active plants are shown in tables 3 and 4. Figure 1 shows the decline in production since 1945.

TABLE 3.—Production and shipments of fuel briquets in the United States, by regions

Region	Active plants	Production (short tons)	Shipments[1]		
			Short tons	Value	
				Total	Average
1962:					
Eastern States	1	(2)	(2)	(2)	(2)
Central States	7	347,318	348,062	$5,448,149	$15.65
Western States	3	222,705	221,851	3,148,872	14.19
Total	11	570,023	569,913	8,597,021	15.08
1963:					
Eastern States	1	(2)	(2)	(2)	(2)
Central States	7	293,610	290,066	4,627,934	15.95
Western States	3	257,597	261,393	3,580,055	13.70
Total	11	551,207	551,459	8,207,989	14.88

[1] Includes 1,464 tons in 1962 used by producers.
[2] Included with "Western States" to avoid disclosing individual company data.

TABLE 4.—Production of fuel briquets in the United States in 1963, by months

Month	Short tons	Month	Short tons	Month	Short tons
January	93,362	May	29,037	September	41,487
February	59,541	June	26,148	October	71,975
March	23,708	July	11,806	November	75,560
April	15,962	August	16,341	December	86,280

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RAW MATERIALS

Raw Fuels.—Briquets were manufactured from 7 different fuels in 1963. Nearly three-fourths of the total raw fuels was low-volatile bituminous coal, and 20 percent was petroleum coke. The remainder (about 7 percent of the total) was Pennsylvania anthracite, other anthracite, semianthracite, high-volatile bituminous coal, and lignite char. All but five plants used more than one type of raw fuel. In most instances, those plants using more than one type combined the fuels to produce a composite briquet. Fourteen percent of the raw fuels originated from screenings in coal yards; the remainder was supplied chiefly by mines and unloading docks.

The average value at the plant of all raw fuels received was $8.14. This was 85 percent of the average unit value of total raw materials used.

Binders.—Thirty-eight thousand tons of binding materials was consumed in 1963. Included in this quantity was 416 tons of spray oil used at 2 plants for dustproofing. Petroleum asphalt, the principal briquet binder, was used exclusively by 10 plants. Asphalt was preferred because it has good cohesive properties; is relatively low in cost; has a low-ash content; and is insoluble in water. One plant, manufacturing barbecue briquets from lignite char, used starch for a binder. Starch is a more costly binding material, but asphalt cannot be used in barbecue briquets because of its high-volatile matter content.

Excluding water, binders constituted 7 percent of the total raw materials, the same percentage as in 1962. The quantities consumed at individual plants ranged from 5 to 11 percent of the total raw materials.

The average value per ton of all binders consumed (including spray oil) was $29.34. On the basis of cost per unit of production, the average value of the binder used to produce each ton of briquets was $2.01. This was about one-fifth of the average value of the total raw materials used in each ton of briquets.

The quantities and values of raw materials used by fuel-briquet plants are shown in tables 5 and 6.

TABLE 5.—Raw fuels used in making fuel briquets in the United States in 1963

Type	Number of plants	Used		
		Short tons	Value	
			Total	Average
Anthracite:				
Pennsylvania	2	(1)	(1)	(1)
Other than Pennsylvania	1	(1)	(1)	(1)
Semianthracite	1	(1)	(1)	(1)
Bituminous coal:				
Low-volatile	9	381,576	$3,027,456	$7.93
High-volatile	1	(1)	(1)	(1)
Petroleum coke	6	103,560	847,245	8.18
Lignite char	1	(1)	(1)	(1)
Undistributed		40,755	405,850	9.96
Total	[2] 11	525,891	4,280,551	8.14

[1] Included with "Undistributed" to avoid disclosing individual company data.
[2] Some plants used more than 1 type of raw fuel; hence, the number of plants exceeds the total shown.

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TABLE 6.—Quantity and value of raw materials used in making fuel briquets in the United States in 1963, by regions

Region	Short tons	Value	
		Total	Average
Fuels:			
Eastern States	(1)	(1)	(1)
Central States	284,356	$2,671,490	$9.39
Western States	241,535	1,609,061	6.66
Total	525,891	4,280,551	8.14
Binders: [2]			
Eastern States	(1)	(1)	(1)
Central States	21,783	573,752	26.34
Western States	16,049	536,310	33.42
Total	37,832	1,110,062	29.34
Fuels and binders:			
Eastern States	(1)	(1)	(1)
Central States	306,139	3,245,242	10.60
Western States	257,584	2,145,371	8.33
Grand total	563,723	5,390,613	9.56

[1] Included with "Western States" to avoid disclosing individual company data.
[2] Includes 416 tons of spray oil used by 2 plants for dustproofing briquets.

SHIPMENTS

Briquets were distributed in 40 States and the District of Columbia, and exported to 14 foreign countries. The quantities distributed to individual States varied greatly, however, ranging from only 3 tons to Wyoming to 94,000 tons to Michigan.

Virtually the same quantity of briquets was distributed in 1963 as was produced. Excluding exports, three-fourths of the total was distributed in seven central and north central States—Indiana, Michigan, Minnesota, Missouri, North Dakota, Ohio, and Wisconsin. Michigan was the largest consumer, followed by Wisconsin, Minnesota, and Indiana. These four States alone received about one-half of the briquets distributed by producers in the United States and shipped abroad. West Virginia, the largest producer, shipped virtually all of its production out of the State.

About three-fourths of the briquets distributed were shipped by rail. The mode of transportation varied, however, with the producing region. Virtually all briquets produced in West Virginia were shipped by rail because most markets were too distant for practical delivery by truck. About two-thirds of the briquets distributed in the central States also were shipped by rail. But two central States—Indiana and Michigan—retained the bulk of their production, and these shipments were delivered principally by truck.

Except for a small quantity of briquets sold in bags, all briquets were shipped and sold as bulk fuel. Shipments by State of origin were not shown because of the small number of producing companies in most States.

The destinations of briquets used and sold and method of shipment in 1963 are shown in tables 7 and 8.

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TABLE 7.—Destination of fuel briquets used and sold by producers [1]

(Short tons)

Destination	1962	1963	Destination	1962	1963
Arizona	40	185	New York	1,353	1,941
California	2,910	3,815	North Carolina	18,554	17,726
Colorado	707	374	North Dakota	31,308	19,535
Connecticut	244	196	Ohio	31,097	29,343
District of Columbia	103	113	Oklahoma		38
Florida	52		Oregon	60	361
Hawaii		60	Pennsylvania	349	512
Idaho	180	14	Rhode Island		15
Illinois	20,773	15,880	South Carolina	771	576
Indiana	42,768	38,599	South Dakota	25,305	20,512
Iowa	19,237	13,833	Tennessee	606	556
Kansas	1,825	1,011	Texas		558
Kentucky	2,660	2,644	Utah	330	356
Maryland	607	873	Virginia	29,687	27,172
Massachusetts	124	518	Washington	1,915	1,530
Michigan	98,134	94,315	West Virginia	276	302
Minnesota	77,094	59,218	Wisconsin	114,364	88,798
Missouri	38,062	24,755	Wyoming	2	3
Montana	189	101			
Nebraska	2,955	1,956	Total	565,238	470,528
Nevada		20	Exported	4,675	[2] 80,931
New Hampshire	79	52			
New Jersey	518	2,060	Grand total	569,913	551,459
New Mexico		102			

[1] Based upon reports from producers showing destination of briquets used and sold.
[2] As reported by producers, this quantity is substantially greater than the total reported by the Bureau of the Census.

TABLE 8.—Shipments of fuel briquets in the United States, by method of transportation [1]

(Short tons)

Origin	1962			1963		
	Rail	Truck	Total	Rail	Truck	Total
Eastern States	[2]	[2]	[2]	[2]	[2]	[2]
Central States	233,349	113,609	346,958	187,979	102,087	290,066
Western States	182,415	39,076	221,491	234,797	26,596	261,393
Total	415,764	152,685	568,449	422,776	128,683	551,459

[1] Includes shipments destined for export as reported by producers directly to the Bureau of Mines.
[2] Included with "Western States" to avoid disclosing individual company data.

VALUE AND PRICE

The total value of briquet shipments, based upon an average price of $14.88 per ton, f.o.b. plant, was $8,207,989. This was a 5-percent decrease in total value from 1962 and a $0.20-per-ton decrease in the average unit value. Plant prices varied somewhat with the area in which briquets were produced. Those produced in the eastern region had relatively low f.o.b. plant values because they were produced at mines from local fuels, whereas briquets produced in the central and western States were manufactured from more costly raw fuels that, in most instances, included additional charges for transportation. The briquets produced in the East, however, were shipped to more distant markets, and transportation costs were included in retail prices at the point of consumption. In general, briquets that were produced and sold in a producing area of the central and western States were competitively priced at the retail level with briquets produced in the East and shipped to more distant markets.

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FOREIGN TRADE [2]

Imports of fuel briquets decreased 45 percent compared with 1962, but were still about 12 times higher than the level of the base years, 1957–59. The total quantity imported in 1963 was 4,620 tons, and all shipments were from Canada. Ninety-three percent of the total entered the United States through the Dakota and Montana and Idaho customs districts. These were principally bulk shipments that, presumably, were consumed in the northwest areas.

The unit value of imported briquets decreased from $48.81 per ton in 1962 to $17.71 in 1963, a decline caused principally by a change in type of shipments. Whereas virtually all briquets imported in 1962 were packaged, most of the shipments in 1963 were in bulk.

Exports increased substantially in 1963, but the exact quantities exported to Europe are not known. See tables 1, 7, and 10. It is estimated that total exports for the year ranged between 85,000 and 90,000 tons. This is about five times the quantity of briquets exported in 1962 and nearly twice the amount exported in the base years, 1957–59. Europe was the principal export market, receiving an estimated 85 to 90 percent of the total shipments. Most of the briquets exported to Europe were shipped to Germany, the Netherlands, and Italy. The remainder was shipped principally to Canada. Exports to Canada were only about one-half as large as in 1962, and about one-sixth the size of the base years.

Export and import data are shown in tables 1, 7, 9, and 10.

TABLE 9.—Fuel briquets (coal and coke) imported for consumption in the United States, by countries and customs districts

Country and customs district	1961		1962		1963	
	Short tons	Value	Short tons	Value	Short tons	Value
Canada:						
Buffalo	1,821	$91,877	3,166	$156,633	140	$7,000
Dakota	921	48,014	1,101	40,614	1,289	18,957
Duluth and Superior	187	9,341	135	6,788	----------	----------
Hawaii	96	3,427	162	5,581	127	6,879
Michigan	500	26,278	1,006	57,698	36	1,687
Montana and Idaho	1,477	73,758	1,341	66,081	3,028	47,300
Washington	2,100	104,192	1,462	74,902	----------	----------
Total	7,102	356,887	8,373	408,297	4,620	81,823
Japan:						
Hawaii	25	1,543	11	675	----------	----------
Los Angeles	135	7,259	----------	----------	----------	----------
New York	(1)	18	----------	----------	----------	----------
San Francisco	20	982	3	231	----------	----------
Washington	50	2,830	----------	----------	----------	----------
Total	230	12,632	14	906	----------	----------
United Kingdom: Los Angeles	6	466	9	597	----------	----------
Grand total	7,338	369,985	8,396	409,800	4,620	81,823

[1] Less than 1 ton.

Source: Bureau of the Census.

[2] Figures on imports and exports compiled from records of the Bureau of the Census.

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TABLE 10.—Fuel briquets (coal and coke) exported from the United States, by countries of destination and customs districts

	1961		1962		1963	
	Short tons	Value	Short tons	Value	Short tons	Value
Country or area:						
North America:						
Bahamas					14	$206
Barbados			16	$232		
British Honduras	19	$266	18	270		
Canada	11,063	152,791	17,028	213,314	9,062	125,257
Canal Zone	14	202				
Costa Rica			85	650		
Dominican Republic	111	1,574	538	5,670	831	12,849
Jamaica					14	200
Leeward and Windward Islands			19	232		
Mexico	1,248	17,327	186	2,823	286	3,939
Total	12,455	172,160	17,890	223,191	10,207	142,451
South America:						
Colombia					608	8,594
Paraguay					69	976
Surinam	55	816	61	832		
Venezuela	111	1,317	44	676	179	2,541
Total	166	2,133	105	1,508	856	12,111
Europe:						
Germany, West					425	6,000
Spain			123	1,841	45	640
Total			123	1,841	470	6,640
Asia:						
Indonesia	24	348				
Japan					(1)	(1)
Nansei and Nanpo Islands			403	5,690		
Saudi Arabia	67	945	20	300	119	1,689
Total	91	1,293	423	5,990	119	1,689
Africa:						
Liberia	19	280				
Western Equatorial Africa, n.e.c.			55	426		
Total	19	280	55	426		
Oceania: Australia					728	43,973
Grand total	12,731	175,866	18,596	232,956	[2] 12,380	206,864
Customs district:						
Buffalo	946	14,614	1,433	19,366	400	6,070
Chicago			3,641	25,490		
Dakota	2,883	40,777	3,622	51,676	1,762	25,870
Duluth and Superior	3,480	53,981	2,804	43,947	1,583	23,053
El Paso					67	836
Florida			35	464	28	406
Galveston	187	2,440			170	2,564
Laredo	986	13,893	169	2,563	156	2,203
Los Angeles					728	43,973
Maryland			61	832		
Michigan	2,770	31,944	4,758	62,203	4,267	57,644
Mobile	71	1,004	538	5,670	661	10,285
Montana and Idaho	127	1,800				
New Orleans	73	1,038	103	920	69	976
New York	210	3,046	590	8,507	951	13,464
Ohio					425	6,000
Philadelphia			65	919		
Sabine			55	426		
St. Lawrence	724	7,790	606	8,066	1,050	12,620
San Diego	141	1,654	17	260	63	900
Vermont			45	873		
Washington	133	1,885	54	774		
Total	12,731	175,866	18,596	232,956	[2] 12,380	206,864

[1] Adjusted by Bureau of Mines to none.
[2] Excludes 68,551 short tons exported to Europe, detail not available, as reported to the Bureau of Mines by producers.

Source: Bureau of the Census.

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TECHNOLOGY

Details of a process for manufacturing smokeless barbecue briquets from lignite char were revealed recently by the Husky Oil Co. of Cody, Wyo.[3] Culminating a 2-year research program at the Husky briquetting plant in Dickinson, N. Dak., Husky personnel, in conjunction with Arthur D. Little, Inc., developed a clean-burning lignite briquet that appears to be capable of competing very favorably with hardwood charcoal briquets for use in barbecue grills, ovens, and broilers.

The process consists, essentially, of the carbonization of sized lignite; the removal of pyrites after carbonization; grinding, mixing, and briquetting of the char; and the drying and bagging of briquets. Crushed lignite, 2 to 4 inches in size, first passes through the predryer section of a Lurgi carbonizer where it is dried and partially disintegrated by hot internal gases, then moves by gravity into a carbonizing area through eight connecting chutes. Here, tar and gases are freed from the lignite by the action of hot gases produced in the carbonizer, and the lignite is converted to char. Upon reaching final carbonizing temperature (900° to 1,000° F), the char gravitates to the bottom of the retort where it is cooled and removed through an air-lock valve system. Tar and gases, discharged from the retort, are separated in an electrostatic precipitator, and the tar is distilled in a batch-type unit to yield creosote oil and pitch. The gases are cooled and recycled to the carbonizer where they are burned to provide the heat required for the process.

Sulfur-laden pyrites that did not disintegrate during carbonization are removed from the char by a bar screen and air-flotation tables, and the char is crushed to approximately 4 mesh. The fine char particles then are conveyed pneumatically to an elevated storage hopper from which they are discharged in predetermined amounts to a mixer and mixed with starch binder. After thorough dry mixing, water (12 to 15 percent by weight) is added and, after another mixing cycle, the batch is discharged to a ribbon blender that feeds two Komarek-Greaves presses that compact the wet mix under 5,000 to 10,000 pounds per square inch pressure. Finally, the briquets are screened, dried to about 4-percent moisture, cooled for 72 hours, and then packaged.

A new method for producing strong, binderless briquets from fine, low-volatile bituminous coals by pretreating the coal with paradichlorobenzene or naphthalene vapors was discovered recently by the Coal Research Bureau of the University of West Virginia.[4] Previous studies showed that binderless coal briquets were weak when compacted under moderate pressures because the density of briquets decreased upon removal of compacting pressures, because of the relaxation of coal particles within the briquet. Previous researchers attributed this relaxation to the elastic properties of powders being compressed. This investigation revealed, however, that expansion of gases within the briquet was responsible for a significant portion of the relaxation and that the removal or reduction of these gases

[3] Margolin, S. V., and Henderson, C. M. Processing of Lignite to Commercial Products. Proc. International Briquetting Assoc. 8th Biennial Conf., Denver, Colo., Aug. 1963, pp. 98–107.

[4] Solomon, J. A., and Enright, R. J. An Investigation Into Powder Compaction With Particular Emphasis on Low-Volatile Bituminous Coal. Proc. International Briquetting Assoc. 8th Biennial Conf., Denver, Colo., Aug. 1963, pp. 61–71.

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from the coal before compaction would result in briquets that were superior in strength and density to briquets made from untreated coal.

Essentially, the process consists of storing coal over a bed of naphthalene or paradichlorobenzene crystals to allow the vapors of these volatile chemicals to absorb gases that are on the surface of the coal or in capillaries in the coal particles. The optimum exposure time has not been determined, but briquets made from the same coal sample and compacted under similar pressures had break strengths that increased directly with the time of exposure. A comparison of briquets compacted at pressures of 16,000 pounds per square inch showed that raw coal briquets broke at 940 pounds per square inch while briquets of coal exposed for 7 days broke at 1,590 pounds per square inch and those of 90-day-exposure coal broke at 1,990 pounds per square inch.

A new method developed by the Consolidation Coal Co. for preparing metallurgical fuel from noncoking coals is described in U.S. patent 3,051,628.[5] In this process, coal is carbonized at low temperatures, and the resulting char then is heated further to cause shrinkage. Tar recovered from the carbonization is distilled, and the resultant pitch is first airblown to increase its carbon content, then blended with middle oils, which are also recovered in the distillation. This mixture, used for binder, is added to the char in a ratio of 1 to 4, and after briquetting, the briquets are carbonized.

A French patent (1,317,195) issued in 1962 describes another method for producing smokeless fuel briquets.[6] In this process, coals ranging from low-volatile bituminous to anthracite were crushed below 1 millimeter in size and mixed with 5- to 8-percent pitch, 1- to 2½-percent sulfur, 1- to 2-percent anthracene oil, and 5-percent water. This mixture is immediately briquetted after being heated to 95° to 100° C, and the briquets then are carbonized at 700° C. Carbonizing time, depending upon the rank of coal used, ranges from about 1½ hours for anthracite to nearly 6 hours for bituminous coal.

PACKAGED FUEL

CAPACITY

Maximum annual productive capacity of the packaged-fuel industry in 1963 was 113,000 tons. Although two small plants were abandoned, several plants reported slightly higher capacities, and the total capacity of the industry remained at about the 1962 level. As with the briquet industry, packaged-fuel operations have declined steadily in number in the past decade, and the industry, currently, is about one-third as large as in 1952, the year before the beginning of the decline. Although this industry has more plants than the briquet industry, it is but one-twentieth the size. Most packaged-fuel plants are small; eight had capacities of less than 5,000 tons, and only one was capable of producing over 25,000 tons.

Data on the annual capacity of packaged-fuel plants are shown in table 11.

[5] Coke Review. The British Coke Research Assoc., v. 1, No. 1, Jan.-Mar. 1963, p. 19.
[6] Coke Review. The British Coke Research Assoc., v. 2, No. 2, Apr.-Jun. 1963, p. 19.

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TABLE 11.—Annual capacity and production of packaged-fuel plants in the United States

	Active plants	Annual capacity (short tons)	Production	
			Short tons	Percent of capacity
1959	21	138,100	33,715	24.4
1960	19	123,000	24,706	20.1
1961	16	114,300	19,180	16.8
1962	15	112,900	17,439	15.4
1963:				
Plants with capacity of—				
Less than 5,000 tons	8	16,500	2,038	12.4
5,000 to less than 10,000 tons	2	[1] 96,800	[1] 12,177	12.6
10,000 to less than 15,000 tons	1			
15,000 to less than 25,000 tons	1			
25,000 or more tons	1			
Total	13	113,300	14,215	12.5
Plants with production of—				
Less than 1,000 tons	10	31,300	2,507	8.0
1,000 to less than 3,000 tons	2	[1] 82,000	[1] 11,708	14.3
3,000 to less than 5,000 tons				
5,000 or more tons	1			
Total	13	113,300	14,215	12.5

[1] Combined to avoid disclosing individual company data.

PRODUCTION

Total output in 1963 was 14,215 tons, an 18-percent decrease from 1962. All but one plant reported less output than in the previous year. Production rates also declined. The average rate of operation for the industry, based upon maximum productive capacity, was 12.5 percent, 2.9 points lower than in 1962, and 14.6 points less than the average production rate of the base years, 1957–59.

Thirteen producers in seven States reported production. Michigan, the largest producer, had 56 percent of the total output. Indiana, Ohio, and Wisconsin produced most of the remainder. Michigan and Ohio, with four plants each, had the largest number of operations. Plants in Ohio were small, however, and total output of the State was only 1,080 tons.

Production was seasonal, ranging from 2,387 tons in January to 294 tons in May. All packaged fuel produced in 1963 was sold, plus a small quantity that remained from production in 1962.

The quantity of packaged fuel produced and sold, production by months, and the value of shipments are shown in tables 12 and 13.

RAW MATERIALS

Raw Fuels.—Virtually all packaged fuel was manufactured from low-volatile bituminous coal. One plant, however, used a small quantity of petroleum coke in addition to bituminous coal.

Five plants used yard screenings exclusively; four used raw fuels purchased from other sources; and four used both types. Most of the smaller plants confined their output to available yard screenings. Yard screenings accounted for only 8 percent of the total raw fuels,

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TABLE 12.—Production and shipments of packaged fuel in the United States, by States

State	Active plants	Production (short tons)	Shipments		
			Short tons	Value	
				Total	Average
1962:					
Indiana	2	(1)	(1)	(1)	(1)
Michigan	5	8,874	8,694	$210,669	$24.23
Ohio	5	1,274	1,274	27,215	21.36
Other States [2]	3	7,291	7,291	156,181	21.42
Total	15	17,439	17,259	394,065	22.83
1963:					
Indiana	2	(1)	(1)	(1)	(1)
Michigan	4	7,998	8,342	200,046	23.98
Ohio	4	1,080	1,068	23,482	21.99
Other States [2]	3	5,137	5,145	116,493	22.64
Total	13	14,215	14,555	340,021	23.36

[1] Included with "Other States" to avoid disclosing individual company data.
[2] Illinois, Virginia, Wisconsin.

TABLE 13.—Production of packaged fuel in the United States in 1963, by months

Month	Short tons	Month	Short tons	Month	Short tons
January	2,387	May	294	September	816
February	2,368	June	453	October	900
March	1,746	July	709	November	1,156
April	1,074	August	675	December	1,637

however, because a few of the larger plants used coal purchased from other sources, chiefly docks and other loading and unloading points.

The average value per ton of raw fuels consumed was $9.34, 94 percent of the cost per ton of total raw materials.

Binders.—Starch was used exclusively as a binder by 12 of the 13 active plants. Starch was preferred because it is an excellent packaged-fuel binder that is relatively low in cost. Only small quantities of starch are required for each unit of production. One large plant used petroleum asphalt for binder. Asphalt is cheaper than starch, but considerably more asphalt is required for each ton of packaged fuel produced.

Plants in Michigan and Ohio used only starch, and the average value per ton for binders in these States was $106 and $109, respectively. Exact data on binders could not be shown, but plants in these States used, roughly, 10 pounds of starch, worth about $0.55, to produce each ton of packaged fuel. The low unit value of the binder used by plants in other States was influenced by a large quantity of asphalt consumed by one plant in Wisconsin.

Table 14 shows the quantity and value of raw materials consumed.

SHIPMENTS

All packaged fuel was sold locally except the output of one plant. Of the quantity sold in the local area, about one-fifth was purchased

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TABLE 14.—Quantity and value of raw materials used in making packaged fuel in the United States in 1963, by States

State	Short tons	Value	
		Total	Average
Fuels:			
Michigan	7,998	$76,361	$9.55
Ohio	1,079	10,730	9.94
Other States [1]	5,114	45,492	8.90
Total	14,191	132,583	9.34
Binders:			
Michigan	35	3,706	105.89
Ohio	9	981	109.00
Other States [1]	131	5,717	43.64
Total	175	10,404	59.45
Fuels and binders:			
Michigan	8,033	80,067	9.97
Ohio	1,088	11,711	10.76
Other States [1]	5,245	51,209	9.76
Grand total	14,366	142,987	9.95

[1] Illinois, Indiana, Virginia, Wisconsin.

by consumers at the plant where it was manufactured. The remainder was delivered by producers. Demand was greater than production, and shipments exceeded output by a few hundred tons. Shipments out of the local area were principally by truck, but a small quantity of packaged fuel was shipped by rail.

VALUE AND PRICE

The total value of shipments, based upon an average price of $23.36 per ton, f.o.b. plant, was $340,000. Compared with 1962, the unit value of packaged fuel increased 2 percent.

The average plant price of packaged fuel was about one-third greater than the f.o.b. plant value of fuel briquets, but the values are not comparable because the products and the methods in which they are marketed are different. Because most briquets were sold in bulk for residential heating, their prices were largely competitive with other quality bulk solid fuels. Also, briquets were sold principally through wholesale and retail channels and the actual price to the consumer was substantially greater than the f.o.b. plant value. Packaged fuel, however, is a specialty item, sold chiefly in small quantities directly to the consumer, and the f.o.b. plant value is approximately equivalent of the retail price.

WORLD REVIEW

World production of fuel briquets and other processed solid fuels of mineral origin was estimated at 134 million tons for 1963, a 3-percent increase over output in 1962 and 15 percent more than was produced in the base years, 1957–59. Most of the increase was attributed to larger outputs in Europe, chiefly in France, West Germany, and Belgium.

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Virtually all European countries produced briquets, and Europe's output was 90 percent of the world total. East Germany, the largest producer, had 55 percent of Europe's output and 49 percent of total production throughout the world. Briquets were used extensively in East Germany for residential and industrial fuel, and some were carbonized for use in metallurgical applications. Currently, about one-half of East Germany's total requirement of fuels for energy (88 million tons of coal-equivalent in 1962) is supplied by briquets, all made from lignite. In addition, East Germany exported 6 million tons of lignite briquets in 1962.

West Germany ranked second in output with 18 percent of the world total. Roughly, three-fourths of West Germany's production was lignite briquets; the remainder was produced from bituminous coal and anthracite. Briquets were used principally in West Germany for domestic fuel, but it is estimated that about one-fifth of the production was consumed by power stations, railroads, ships, iron and steel works, and other industries. West Germany exported 1.7 million tons of lignite briquets and 500,000 tons of coal briquets in 1963.

Ranking third in world output, briquet production in the U.S.S.R. was estimated at 9.4 million tons, 7 percent of the world total. Data were not available on the quantity of different fuels briquetted, but it was estimated that perhaps one-third was manufactured from peat and the remainder, from bituminous coal and anthracite. As in other European countries, briquets were used in the Soviet Union principally for domestic heating and for fuel by light industries.

Briquet production in France increased 15 percent over that of 1962, and output was at the highest level since 1957. With 8.8 million tons, France was fourth in world output. French briquets were made principally from bituminous coal and anthracite, and about 90 percent of the total was consumed for domestic fuel. Most of the remainder was used by railroads and industrial plants.

Other European countries with substantial production were Belgium, United Kingdom, the Netherlands, Spain, and Hungary. All produced more than 1 million tons, and their combined output was 6 percent of the total of all countries.

Eight percent of all briquets were produced in Asia, chiefly in Korea and Japan. Both countries used large quantities of briquets for domestic heating and cooking. In Japan about one-half of the briquets, made from anthracite, or a mixture of anthracite and coke, were used for household fuel. Several million tons additional were made from bituminous coal and used for fuel by the Japanese Railway Corp.

Australia produced 2 million tons of briquets and ranked eighth in world output. Australia's production, also, was consumed principally for domestic heating, but some briquets were used in power stations and other industrial plants.

The United States, with 0.4 percent of the total, was 15th in world production.

Total output of fuel briquets and packaged fuel, by countries, is shown in table 15.

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TABLE 15.—World production of fuel briquets and packaged fuel, by countries [1]
(Thousand short tons)

Country	1959	1960	1961	1962	1963
North America:					
Canada	153	82	67	54	73
United States:					
Briquets	867	744	572	570	551
Packaged fuel	34	25	19	17	14
Total	1,054	851	658	641	638
South America: Peru	4				
Europe:					
Belgium	1,105	1,189	1,283	1,766	2,352
Bulgaria [2]	275	275	275	275	275
Czechoslovakia:					
Bituminous	417	360	166		
Lignite	362	481	793	868	[2] 990
Denmark	49	53	62	55	[2] 60
Finland	10	12	10	[2] 18	20
France	7,234	6,693	6,714	7,647	8,817
Germany:					
East: Lignite	59,578	61,787	63,930	65,838	[2] 66,000
West:					
Anthracite and bituminous	5,192	5,753	5,367	6,242	7,003
Lignite	16,761	16,805	17,102	17,383	17,454
Greece	43	97	73	89	[2] 100
Hungary	1,193	1,171	1,253	1,310	[2] 1,300
Ireland [3]	49	137	233	248	[2] 248
Italy: Anthracite	26	30	32	65	140
Netherlands:					
Anthracite and bituminous	1,168	1,302	1,310	1,509	1,721
Lignite	71	69	82	78	69
Poland:					
Bituminous	753	791	744	721	[2] 690
Litnite	353	345	373	380	[2] 390
Portugal	66	60	62	85	[2] 46
Rumania [3]	303	331	331	331	331
Spain	1,408	1,260	1,232	1,364	1,305
Sweden	68	60	[2] 65	[2] 65	[2] 65
Switzerland [3]	110	110	110	110	110
U.S.S.R. [3]	9,400	9,400	9,400	9,400	9,400
United Kingdom	1,893	1,582	1,644	1,734	[2] 1,880
Yugoslavia	18	10	6	[2] 28	[2] 28
Total	107,900	110,150	112,650	117,600	120,800
Asia:					
Afghanistan	[2] 24	[2] 22	21	[2] 21	[2] 22
Indonesia	11	[2] 11	[2] 11	[2] 11	[2] 11
Japan	[2] 2,800	[2] 3,200	4,529	4,605	4,740
Korea, Republic of	2,454	3,206	[2] 4,400	5,460	[2] 5,500
Pakistan [3]	17	17	22	22	22
Turkey	139	154	74	17	
Viet-Nam, South [3]	61	61	61	61	61
Total	5,500	6,650	9,100	10,200	10,400
Africa:					
Algeria	54	50	45	[2] 30	[2] 45
Morocco	22	25	26	25	20
Tunisia [3]	6	6	7	8	8
Total	82	81	78	63	73
Oceania:					
Australia	753	1,694	2,062	2,002	2,113
New Zealand	18	17	17	13	[2] 13
Total	771	1,711	2,079	2,015	2,126
World total	115,300	119,400	124,600	130,500	134,000

[1] Includes briquets made from coal, lignite, and peat and revisions of data published previously. Data do not add to totals shown owing to rounding.
[2] Estimated.
[3] Year ended March 31 of year following that stated.

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Peat

By Eugene T. Sheridan [1]

Contents

	Page		Page
General summary	307	Consumption and uses	315
Government regulations	310	Value and price	317
Scope of report	310	Foreign trade	317
Reserves	312	Technology	320
Production	314	World review	323

GENERAL SUMMARY

PEAT production in the United States continued to increase in 1963, and output for the year was 578,530 tons. This was a 1-percent increase over production for 1962 and the largest output reported to date.

One hundred and twelve producers in 23 States reported production or commercial sales at 113 operations. Michigan, with one-fourth of the active operations and 44 percent of the output, remained the leading producer. Indiana and Pennsylvania followed Michigan in production with 10 percent and 8 percent, respectively, of the total output.

Twenty percent of the production was moss peat; 53 percent, reed-sedge peat; and 27 percent, humus. Twelve percent was sold as excavated, and the remainder was processed by shredding or pulverizing, screening, and, in a few instances, thermal drying.

Virtually all peat was sold for agricultural or horticultural uses. Of the total domestic peat distributed, 96 percent was sold to contractors and landscape gardeners for building lawns and golf course greens and planting trees and shrubs; to nurseries and greenhouses for starting and growing plants; and to homeowners for improving lawns and soils and for mulching. The remainder was sold for use in potting soils, mixed fertilizers, mushroom beds, earthworm culture, packing flowers and shrubs, and seed inoculant. No peat was reported sold for fuel or energy purposes.

Fifty-one percent of the peat sold was packaged, principally in 25-, 50-, and 100-pound moisture-proof bags. Thirty-four producers in 16 States sold packaged peat.

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[1] Supervisory mineral specialist, Division of Bituminous Coal.

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The total value of commercial sales, f.o.b. plant, was $5.4 million—a 5-percent increase over 1962 sales. The average unit value of peat sold increased also—from $9.15 per ton in 1962 to $9.92 per ton in 1963.

Imports decreased 2 percent, chiefly because of smaller shipments from Canada. Canada, however, supplied about four-fifths of the peat imported.

World production was estimated at 169.5 million short tons, the same quantity as in 1962. It was estimated that about 40 percent was used for fuel, and the remainder for agricultural purposes. The U.S.S.R. was the principal producer, with output estimated at 95 percent of the world total.

Salient statistics for the base and current years are shown in table 1. Figure 1, showing production and import data, indicates the available supply of peat in the United States for 1954–63.

TABLE 1.—Salient peat statistics

	1957–59 (average)	1960	1961	1962	1963
United States:					
Number of operations	87	115	128	117	113
Production short tons	354,497	470,889	531,067	571,873	578,530
Commercial sales do	342,711	430,664	492,798	566,441	546,621
Value of sales	$3,556,218	$4,456,510	$4,672,933	$5,185,627	$5,422,877
Average per ton	$10.38	$10.35	$9.48	$9.15	$9.92
Imports short tons	267,525	263,877	252,437	267,678	261,331
Available for consumption [1] do	610,236	694,541	745,235	834,119	807,952
World production do	[2] 71,100,000	168,500,000	[3] 165,700,000	[3] 169,500,000	169,500,000

[1] Commercial sales plus imports.
[2] In addition, the U.S.S.R. produced an undetermined quantity of agricultural peat.
[3] Revised figure.

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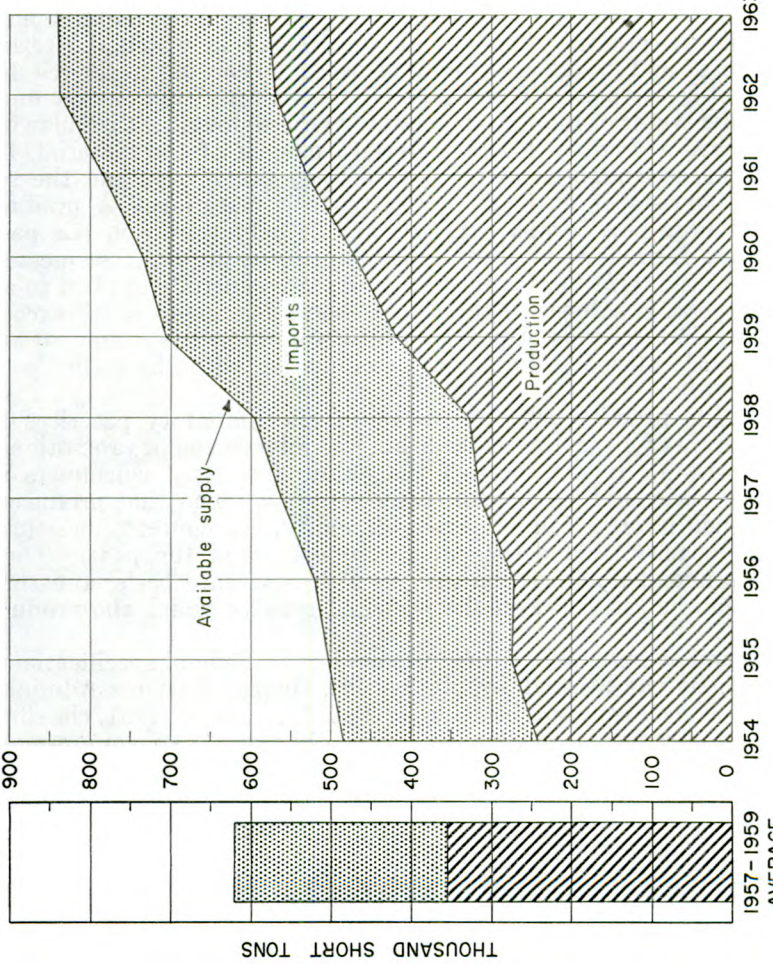

FIGURE 1.—Production, imports, and available supply of peat in the United States, 1954–63.

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GOVERNMENT REGULATIONS

There are no national standards in the United States for differentiating among peats according to their various chemical and physical characteristics and suitability for different uses. The sale of peat, however, is governed by trade regulations, established by the Federal Trade Commission, to promote fair labeling and selling practices within the industry. In general, the regulations forbid unfair or deceptive practices in marketing, misrepresentations, and the use of deceptive trade or corporate names. They also state the requirements for labeling a product "peat" and the manner in which the terms "peat moss" and "moss peat" may be used. According to the regulations, peat is any partially decomposed plant matter that has accumulated under water or in a water-saturated environment. It is unlawful to designate a product "peat" unless 75 percent of the material, by dry-weight, is composed of peat, as defined previously, and the remainder consists of normally associated soil materials. A product labeled "moss peat" must conform to this definition, and the peat must have been formed from sphagnum, hypnum, or other mosses. The use of the term "peat moss," a misnomer generally applied to all types of peat, is subject to the requirements for "moss peat" except when the kind or kinds of peat of which the product is composed are conspicuously stated in immediate conjunction with the term "peat moss."

The trade practice rules also prohibit discriminatory practices in pricing, grants for services or facilities, and advertising or promotional allowances. To further protect the public and assist consumers in using the various kinds of peat, the rules recommend that producers furnish such information as degree of acidity, ash content, moisture-holding capacity, and degree of decomposition of the peat. They also recommend that peat be sold on a dry-measure basis, and that information be furnished on the principal uses for which the product is suitable.

Government purchases of peat are subject to Federal specifications, developed by the Federal Supply Service, General Services Administration. The current specification, Q–P–166e, May 10, 1961, classifies and lists the requirements for four types of peat: (1) sphagnum-moss peat, (2) other moss peats, (3) humus peat, and (4) reed-sedge peat. The Federal Supply Service also supplies information on sampling, inspection, and testing procedures, and outlines the requirements for packaging and marking containers.

SCOPE OF REPORT

This chapter, except where noted, is based upon data submitted voluntarily by producers of peat in the United States. Similar reports on the peat industry have been published each year since 1934, when the Bureau of Mines resumed the industry survey conducted from 1908 to 1926 by the Geological Survey. No data were collected or published by either agency between 1926 and 1934.

Complete coverage of the industry was attempted, and all reported production was included. No estimates were made for nonreporting companies, which were assumed to have been idle or not producers.

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Questionnaires were mailed to all companies that reported commercial production within the past 3 years and to companies that were reported to be peat producers. Mailing lists are kept current by requesting producers to furnish names and addresses of new operations in their areas; from information obtained from State mineral and commodity reports; and from information furnished Bureau of Mines field personnel in various areas of the United States. Because of the nature of the domestic peat industry, this survey may have failed to reach all producers. However, all major, and most of the smaller producers were canvassed, and the data include virtually all peat that was produced in the United States for commercial sale.

The survey revealed that there were 113 active and 11 idle peat operations in 1963. Twleve companies reported they had abandoned their operations and 28 companies did not respond to the survey or reported they were not peat producers. Two of the active plants produced peat in 1963 but had no sales.

Peat is classified in this report as moss peat, reed-sedge peat, and humus. The first two are classified according to biological origin. The moss type has formed principally from sphagnum, hypnum, or other mosses, while reed-sedge peat has originated principally from reeds, sedges, and associated swamp plants. Plant remains are identifiable in both types, but reed-sedge peat usually is more decomposed than moss peat. Humus includes all peat so decomposed that its biological identity cannot be determined. These classifications are less restrictive than those of the Federal specifications governing purchases of peat by the Federal Government, but the nature of the domestic peat industry makes it impractical to make them more limiting, particularly for reporting purposes. A few producers reported production of more than one type, but in some instances deposits contained layers of different types that were removed separately.

Unprepared peat had no processing other than air drying. Processed peat was shredded, screened, and, in a few instances, artificially dried. Cultivating refers to the operation of aerating peat prior to excavation by turning over the surface layer of the deposit with a disk or spike harrow.

Data were requested on production, sales, value of sales, uses, location and size of deposits, and types of equipment used. Data shown on uses include peat produced in the United States only, because no information was available on imported peat other than its classification of fertilizer grade and poultry and stable grade. In a few instances where the producer did not report the use for which peat was sold, the production was assumed to have been sold for general soil improvement.

All values for domestic peat were based upon producers' selling prices at the plant. These values in general did not include the cost of containers for peat sold in packages, but the cost of containers may have been included by some producers. In some instances where a producer failed to show the value of his sales, values were estimated by using those reported for similar types of peat by producers within the State.

All quantities are shown in short tons of 2,000 pounds.

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RESERVES

The peat resources of the United States have been extensively surveyed, and known reserves are estimated at approximately 14 billion short tons of air-dried peat. These resources are widely distributed, and deposits occur in 34 States. Approximately nine-tenths of the total, however, are in four States—Florida, Michigan, Minnesota, and Wisconsin.

Major peat deposits occur in two general geographic areas. The northern region (with about 80 percent of the total reserves) covers, roughly, the area north of the 41st parallel and east of the 97th meridian. It includes all of the New England States, Illinois, Indiana, Iowa, Michigan, Minnesota, New Jersey, New York, Ohio, Pennsylvania, and Wisconsin. The Atlantic coast region, with most of the remaining reserves, includes all of Florida and the coastal areas of all States south of New Jersey that border the Atlantic Ocean.

In the northern region, peat has accumulated chiefly in former lakes, marshes, and ponds, and the deposits are classified as the filled-basin type. They consist of partially decomposed peat, formed principally from reeds, sedges, grasses, or other swamp plants, underlain by a layer of well-decomposed peat that formed from algae and other simple plants when the basin was first established. In many areas these deposits are covered with a layer of "built-up" peat, formed principally from mosses and shrubs that grew on the surface of the deposit after the basin was filled to the level of the surrounding countryside. In most areas this stratum of moss peat is quite thin. In others, however, where drainage was poor, many feet of moss peat has accumulated. In a few of the northern areas, particularly Maine, there are large deposits of built-up peat, formed from the accumulation of mosses and shrubs on flat or gently sloping surfaces.

The Atlantic coast region is characterized by many salt- and fresh-water marshes and swamps, and peat deposits occur principally in valleys and lagoons that were formed by the gradual subsidence of the coastal plain. This peat has formed principally from salt-marsh grasses and other salt-water plants; however, many deposits also have an underlayer of peat formed from fresh-water plants that were deposited before the coast subsided. Deciduous and coniferous trees also have contributed to peat formation in many areas in this region.

Approximately 75 percent of the total U.S. reserves are in three northern States—Minnesota, Wisconsin, and Michigan. Deposits occur in most areas of all three States; the bulk of the peat, however, is found north of the 45th parallel. This region is characterized by relatively low temperatures and high humidity which are conducive to peat formation.

Minnesota's reserves, estimated at 6.8 billion tons, are the largest in the United States. Peat deposits are in virtually all areas of Minnesota, but more than three-fourths of the total reserves are in four northern counties.

Wisconsin has about 1 million acres of peatlands, and reserves are estimated at 2.5 billion tons. As in Minnesota, these are widely scattered, but the most extensive deposits are in the northern part of the State.

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Michigan's reserves are estimated at 1 billion tons. Deposits are well distributed throughout the State, but the largest and most extensive are in the north where some bogs exceed 25 square miles in area and are 2 to 20 feet deep. There are many smaller deposits in central and southern Michigan.

Peat occurs in all New England States, but four-fifths of the New England reserves are in Maine. Maine's reserves are estimated at 100 million tons, of which about one-half are in the coastal areas and near the lower courses of major streams. The remainder is in heavily forested areas in the northern and western parts of the State and is relatively inaccessible.

All States along the Atlantic coast have peat deposits, but about 75 percent of the estimated 2.7 billion tons of the Atlantic coastal region is in Florida. Peat occurs in virtually all parts of Florida, which ranks third in total U.S. reserves. The Dismal Swamp in Virginia and North Carolina is the second largest peat area of the Atlantic coast region.

There are small deposits of peat also in the coastal areas of Alabama, Louisiana, Mississippi, and Texas; in California, Oregon, and Washington on the west coast; and in Colorado, Idaho, and Montana. Less than 1 percent of the total U.S. reserves are in these States.

Known original reserves of peat in the United States, as reported by the Geological Survey in 1922, are shown in table 2. The reserves remain virtually intact, because only 6.3 million tons, or less than 0.05 percent of the total, has been extracted for commercial sale.

TABLE 2.—Known original reserves of peat in the United States, estimated on an air-dried basis, by regions and States [1]

(Thousand short tons)

Region and State	Reserves	Region and State	Reserves
Northern region:		Atlantic coast region:	
Minnesota	6,835,000	Virginia and North Carolina	700,000
Wisconsin	2,500,000	Florida	2,000,000
Michigan	1,000,000	Other States [2]	2,000
Iowa	22,000		
Illinois	10,000	Total	2,702,000
Indiana	13,000		
Ohio	50,000	Other regions:	
Pennsylvania	1,000	Gulf coast [3]	2,000
New York	480,000	California	72,000
New Jersey	15,000	Oregon and Washington	1,000
Maine	100,000		
New Hampshire	1,000	Total	75,000
Vermont	8,000		
Massachusetts	12,000		
Connecticut	2,000		
Rhode Island	1,000		
Total	11,050,000	Total all regions	13,827,000

[1] Geological Survey. Coal Resources of the United States (Progress Report). Circ. 293, Oct. 1, 1953, p. 38.
[2] Includes Delaware, Maryland, South Carolina, and Georgia.
[3] Excludes Florida.

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PRODUCTION

Despite a decrease in operations, peat production increased slightly in 1963, and output reached 578,530 tons. This was 1 percent more peat than was produced in 1962, nearly two-thirds more than the quantity produced annually in the base years, 1957–59, and the largest output recorded to date. Reported production was somewhat smaller than anticipated because a number of plants that operated in 1962 were idle or abandoned, and one large operation in Montana was sold during the year and the new owner could not be located.

Although peat was produced at 113 operations in 23 States, more than three-fourths of the plants were small, with annual outputs of less than 5,000 tons, and about one-third produced less than 1,000 tons. Twenty-six plants with outputs greater than 5,000 tons supplied 78 percent of the total production. Only five plants produced over 25,000 tons.

Michigan, with 28 operations and 44 percent of the output, remained the leading producer. Indiana, with six operations, ranked second in output, and Pennsylvania, with seven, was third. These three States accounted for 62 percent of the production in 1963.

Twenty percent of the production was moss peat; 53 percent, reed-sedge peat; and 27 percent, humus. Twelve percent was air-dried and sold as excavated. The remainder was processed by shredding or pulverizing, screening, and, in a few instances, by artificial drying. Approximately 54 percent of the total output was cultivated before it was extracted. Cultivation, as explained in the "Scope of Report" section, is a method of reducing the moisture content of peat by loosening the surface layer of a bog with a disk or spike harrow before peat is extracted.

Production methods varied greatly but, except for one operation, all peat was extracted by machinery. Equipment consisted principally of conventional types of excavating and earthmoving machines, including power shovels, earthmovers, draglines, bulldozers, clamshells, dredges, front-end loaders, and belt and bucket loaders. Most of the machines were modified, however, to make them suitable for operating in wet areas. A few operations employed specially-designed excavating and conveying equipment. Processing machinery included a variety of shredders, grinders, hammermills, and screens, and five operations used gas- or oil-fired rotary driers.

Tables 3 and 4 show production of peat by kinds and the quantity of peat produced and sold in each State. Table 5 shows the relative size and output of the operations.

TABLE 3.—Peat produced in the United States in 1963, by kinds
(Short tons)

Kind	Total	Unprepared	Processed	
			Shredded	Shredded and kiln-dried
Moss	115,570	12,246	93,624	9,700
Reed-sedge	308,906	20,124	287,807	975
Humus	154,054	38,977	111,999	3,078
Total	578,530	71,347	493,430	13,753

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TABLE 4.—Production and commercial sales of peat in the United States in 1963, by States

State	Active plants	Production (short tons)	Commercial sales		
			Short tons	Value	
				Total	Average
California	5	43,873	39,873	$450,193	$11.29
Colorado	5	13,774	13,774	97,724	7.09
Connecticut, Maine, Massachusetts	5	4,941	4,441	58,933	13.27
Florida	7	22,143	21,049	129,380	6.15
Georgia, Maryland, South Carolina	5	11,642	10,998	112,640	10.24
Idaho, Montana, North Dakota	3	2,070	1,320	24,550	18.60
Illinois and Iowa	4	21,732	21,732	239,939	11.04
Indiana	6	55,745	47,695	411,848	8.64
Michigan	28	255,859	251,809	2,412,995	9.58
Minnesota	6	8,373	8,110	294,373	36.30
New Jersey	3	23,685	23,685	241,042	10.18
New York	5	21,358	21,358	177,664	8.32
Ohio	10	7,110	6,910	108,876	15.76
Pennsylvania	7	44,910	33,952	338,667	9.97
Washington	11	38,648	37,248	187,549	5.04
Wisconsin	3	2,667	2,667	136,504	51.18
Total	113	578,530	546,621	5,422,877	9.92

TABLE 5.—Relative size of peat operations in the United States

Size	1962				1963			
	Active plants		Production		Active plants		Production	
	Number	Percent of total	Short tons	Percent of total	Number	Percent of total	Short tons	Percent of total
Under 500 tons	27	23.5	3,883	0.7	25	22.1	5,062	0.9
500–999 tons	14	12.2	9,925	1.7	18	15.9	12,678	2.2
1,000–4,999 tons	44	38.3	94,104	16.5	44	39.0	108,552	18.7
5,000–14,999 tons	21	18.2	159,286	27.9	16	14.2	123,816	21.4
15,000–24,999 tons	4	3.5	66,000	11.5	5	4.4	88,484	15.3
Over 25,000 tons	5	4.3	238,675	41.7	5	4.4	239,938	41.5
Total	[1] 115	100.0	571,873	100.0	113	100.0	578,530	100.0

[1] Excludes 2 plants that did not produce, but sold peat from stock.

CONSUMPTION AND USES

Both imports and sales of domestic peat decreased slightly, and the quantity of peat apparently consumed in the United States was 3 percent less than in the previous year.

Purchases for general soil improvement accounted for 96 percent of the total commercial sales. This peat was sold principally to nurseries and greenhouses for use in growing and cultivating plants, trees, and shrubs; to landscape gardeners and contractors for building lawns and golfcourse greens and for transplanting trees and shrubs; and to garden, chain, and variety stores that sold peat to homeowners for mulching and improving lawns and garden soils. Two percent was sold for use in potting soils and for seed inoculant, and the remainder, for packing flowers and shrubs and for use in mixed fertilizers, earthworm culture, and mushroom beds. No peat was sold for fuel or energy purposes.

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Fifty-one percent of all peat sold was packaged. This was 7 percent less than the quantity packaged in 1962, but about 2% more than was packaged annually in 1957–59. The sharp increase in packaged sales in recent years has resulted from the development of synthetic films from which inexpensive, moisture proof bags are manufactured. These containers have enabled producers to distribute peat on a national basis, whereas, only a few years ago, it was uneconomical to ship peat out of the producing area. Most packaged domestic peat was sold by weight in containers of 25, 50, and 100 pounds.

Commercial sales by States, kinds, and uses are shown in tables 6 and 7.

TABLE 6.—Commercial sales of peat in the United States in 1963, by kinds and uses

Use	Moss			Reed-sedge			Humus		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average		Total	Average		Total	Average
Bulk:									
Soil improvement	45,264	$371,627	$8.21	85,539	$732,660	$8.57	124,515	$624,374	$5.01
Other uses	2,645	24,937	9.43	7,382	54,973	7.45	3,808	42,713	11.22
Total	47,909	396,564	8.28	92,921	787,633	8.48	128,323	667,087	5.20
Packaged:									
Soil improvement	44,835	870,721	19.42	206,328	2,092,554	10.14	17,426	166,824	9.57
Other uses	63	1,900	30.16	6,456	253,585	39.28	2,360	186,009	78.82
Total	44,898	872,621	19.44	212,784	2,346,139	11.03	19,786	352,833	17.83
Total:									
Soil improvement	90,099	1,242,348	13.79	288,957	2,763,876	9.57	141,941	791,198	5.57
Other uses	2,708	26,837	9.91	16,748	369,896	22.09	6,168	228,722	37.08
Grand total	92,807	1,269,185	13.68	305,705	3,133,772	10.25	148,109	1,019,920	6.89

TABLE 7.—Commercial sales of peat in the United States in 1963, by uses

Use	In bulk			In packages			Total		
	Short tons	Value		Short tons	Value		Short tons	Value	
		Total	Average		Total	Average		Total	Average
Soil improvement	255,318	$1,728,661	$6.77	268,589	$3,130,099	$11.65	523,907	$4,858,760	$9.27
Potting soils	[1] 5,169	[1] 31,588	[1] 6.11	[1] 6,718	[1] 410,831	[1] 61.15	[1] 11,887	[1] 442,419	[1] 37.22
Packing flowers, shrubs, etc	4,176	36,427	8.72	2,161	30,663	14.19	6,337	67,090	10.59
Mushroom beds	[2] 1,426	[2] 14,034	[2] 9.84	---	---	---	[2] 1,426	[2] 14,034	[2] 9.84
In mixed fertilizers	3,064	40,574	13.24	---	---	---	3,064	40,574	13.24
Total	269,153	1,851,284	6.88	277,468	3,571,593	12.87	546,621	5,422,877	9.92

[1] Includes small amount sold for seed inoculant.
[2] Includes small amount sold for earthworm culture.

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VALUE AND PRICE

Although sales of peat decreased slightly, plant prices increased an average of 8 percent, and the total value of commercial sales, f.o.b. plant, was $5.4 million. This was a 5-percent increase over 1962 sales and the highest value reported to date.

The average price per ton of all peat sold was $9.92. Prices of different types varied greatly, however, and depended chiefly upon whether peat was sold unprepared or processed, and in bulk or in packages. The average plant price of bulk peat was $6.88 per ton, while the unit price for packaged peat was $12.87 per ton. Individual plant prices ranged from less than $2 per ton for unprepared peat sold in bulk to $75 per ton for packaged peat sold for special uses. Of the total sold, packaged humus, for uses other than soil improvement, had the highest average unit price—$78.82 per ton. Most of this material was finely ground and artificially dried for use as seed inoculant. Humus sold in bulk for general soil improvement had the lowest average value—$5.01 per ton.

The total value of imported peat was $12.4 million. This value, established at the port of embarkation, was approximately equal to prices paid by importers, less transportation and other miscellaneous charges. In some instances, ocean freight and other nondutiable charges such as insurance may have been included inadvertently.

The average unit value of imported peat was $47.29 per ton, $0.78 per ton less than in 1962. The decrease was due principally to lower values of peat imported from Canada.

The unit value of imported peat was about five times that shown for domestic peat, but the values are not comparable because they were assigned at different marketing levels. Also, most of the domestic peat has different physical properties. Imported foreign peat is light and fibrous, usually is packaged in bales, and is sold on a volume basis. Most of the packaged domestic peats are more decomposed, have a higher moisture content, and are sold by weight. To indicate respective densities, each 100 pounds of a typical imported peat will measure approximately 12 bushels, whereas 100 pounds of a typical domestic peat will measure only 3 or 4 bushels. A few domestic operations, however, produce peat with properties similar to those of the imported type. A 100-pound bag of domestic reed-sedge peat currently can be purchased in the Washington, D.C., area for $1.69; a 7½-cubic-foot bale of imported peat retails for $4 to $5 in the same area.

FOREIGN TRADE [2]

Imports were 2 percent less than in 1962 and were also 2 percent less than in 1957–59. Canada remained the principal supplier of foreign peat, shipping four-fifths of the total imported. Virtually all of the remainder originated in Europe.

West Germany supplied 70 percent of the European peat and Poland and Danzig, Sweden, Ireland, and the Netherlands shipped most of the remainder. European imports declined 4 percent, chiefly because of smaller shipments from Ireland, the Netherlands, and Poland and Danzig. Imports of peat (classified as "fertilizer grade") from West Germany increased, however, and entered the United

[2] Figures on imports compiled from records of the Bureau of the Census.

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States chiefly through the east coast customs districts of Florida, Maryland, New York, Philadelphia, and Virginia.

Canadian shipments were principally "fertilizer grade" peat that entered the United States chiefly through the Washington customs district and Great Lakes ports. Most of the imported Canadian peat, classified by texture as coarse, medium, or fine, was baled or packaged in paper cartons with synthetic film liners. The coarse material was supplied chiefly for stable litter; medium, for poultry and small animal litter; and fine, for soil conditioning. Imports from Canada were about 2 percent less than in 1962.

Imported peat was classified according to use into two grades: "poultry and stable" and "fertilizer." Data were not available on ultimate end uses, but the poultry and stable grade presumably was used for litter, and the fertilizer grade for various types of soil improvement. Of the total imports, 98 percent were classified fertilizer grade and entered the United States duty-free. A duty of $0.25 per long ton was levied on peat classified as poultry and stable grade.

Tables 8, 9, and 10 show the quantity and value of the different grades of peat imported, by countries and customs districts.

TABLE 8.—Peat moss imported for consumption in the United States, by kinds and by countries

Country	Poultry and stable grade		Fertilizer grade		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1961:						
North America:						
Canada	6,614	$478,461	182,176	$10,196,741	188,790	$10,675,202
Mexico	80	2,969			80	2,969
Total	6,694	481,430	182,176	10,196,741	188,870	10,678,171
Europe:						
Belgium-Luxembourg			60	2,885	60	2,885
Denmark	9	400	4,013	184,850	4,022	185,250
Finland			72	3,975	72	3,975
Germany, West	1,717	63,327	45,482	1,747,199	47,199	1,810,526
Ireland			381	15,371	381	15,371
Netherlands	175	11,062	3,264	134,352	3,439	145,414
Norway			40	10,713	40	10,713
Poland and Danzig			7,583	280,880	7,583	280,880
Sweden			508	35,505	508	35,505
U.S.S.R			175	5,468	175	5,468
United Kingdom			80	2,440	80	2,440
Total	1,901	74,789	61,658	2,423,638	63,559	2,498,427
Asia: Japan	8	1,876			8	1,876
Grand total	8,603	558,095	243,834	12,620,379	252,437	13,178,474

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TABLE 8.—Peat moss imported for consumption in the United States, by kinds and by countries—Continued

Country	Poultry and stable grade		Fertilizer grade		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
1962:						
North America:						
Canada	5,601	$389,434	209,266	$10,418,008	214,867	$10,807,442
Mexico	58	2,885			58	2,885
Total	5,659	392,319	209,266	10,418,008	214,925	10,810,327
Europe:						
Belgium-Luxembourg			26	496	26	496
Denmark			163	5,109	163	5,109
Finland			25	919	25	919
France			34	1,110	34	1,110
Germany, West	559	20,134	33,972	1,296,940	34,531	1,317,074
Ireland			3,002	111,635	3,002	111,635
Netherlands	104	4,611	1,953	76,312	2,057	80,923
Norway			32	7,912	32	7,912
Poland and Danzig			8,531	335,200	8,531	335,200
Sweden			3,624	169,171	3,624	169,171
U.S.S.R.			525	17,834	525	17,834
United Kingdom			194	7,255	194	7,255
Total	663	24,745	52,081	2,029,893	52,744	2,054,638
Asia: Japan	9	3,203			9	3,203
Grand total	6,331	420,267	261,347	12,447,901	267,678	12,868,168
1963:						
North America:						
Canada	4,135	248,500	206,649	10,038,335	210,784	10,286,835
Guatemala	7	358			7	358
Mexico	40	4,239			40	4,239
Total	4,182	253,097	206,649	10,038,335	210,831	10,291,432
Europe:						
Denmark	17	767	212	9,736	229	10,503
Finland			123	5,240	123	5,240
France			7	368	7	368
Germany, West	[1] 1,273	55,440	34,099	1,411,885	35,372	1,467,325
Ireland	62	2,200	2,293	88,993	2,355	91,193
Netherlands	84	3,959	1,558	57,993	1,642	61,952
Poland and Danzig			6,786	247,017	6,786	247,017
Sweden			3,677	171,173	3,677	171,173
Portugal			124	2,000	124	2,000
United Kingdom			130	5,345	130	5,345
Total	1,436	62,366	49,009	1,999,750	50,445	2,062,116
Asia: Japan	4	2,085	51	1,924	55	4,009
Grand total	[1] 5,622	317,548	255,709	12,040,009	261,331	12,357,557

[1] Adjusted by Bureau of Mines.

Source: Bureau of the Census.

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TABLE 9.—Peat moss imported for consumption in the United States in 1963, by kinds and by customs districts

Customs district	Poultry and stable grade		Fertilizer grade		Total	
	Short tons	Value	Short tons	Value	Short tons	Value
Buffalo	39	$1,567	36,212	$1,692,690	36,251	$1,694,257
Chicago			494	15,012	494	15,012
Dakota	2,550	173,795	20,669	868,639	23,219	1,042,434
Duluth and Superior	20	1,966	175	9,472	195	11,438
Florida	7	358	6,413	266,465	6,420	266,823
Galveston	17	767	1,378	57,712	1,395	58,479
Georgia			221	6,978	221	6,978
Hawaii	4	2,085			4	2,085
Laredo	40	4,239	94	4,350	134	8,589
Los Angeles			1,437	69,560	1,437	69,560
Maine and New Hampshire	19	585	1,570	68,113	1,589	68,698
Maryland	269	8,921	4,578	197,886	4,847	206,807
Massachusetts			1,861	76,647	1,861	76,647
Michigan	265	12,237	26,183	1,126,367	26,448	1,138,604
Mobile			3,234	135,083	3,234	135,083
Montana and Idaho	41	1,524	310	14,881	351	16,405
New Orleans	520	21,425	4,979	199,842	5,499	221,267
New York	428	23,738	13,233	543,069	13,661	566,807
North Carolina			103	3,381	103	3,381
Ohio			564	22,204	564	22,204
Oregon			133	5,790	133	5,790
Philadelphia	[1] 133	5,136	5,842	216,703	5,975	221,839
Puerto Rico			88	5,616	88	5,616
St. Lawrence	306	12,699	24,211	949,550	24,517	962,249
San Francisco			453	18,545	453	18,545
South Carolina			675	31,934	675	31,934
Vermont	606	24,106	38,736	1,495,170	39,342	1,519,276
Virginia	70	2,379	3,197	123,744	3,267	126,123
Washington	288	20,021	58,464	3,809,210	58,752	3,829,231
Wisconsin			202	5,396	202	5,396
Total	[1] 5,622	317,548	255,709	12,040,009	261,331	12,357,557

[1] Adjusted by Bureau of Mines.

Source: Bureau of the Census.

TECHNOLOGY

One method for producing peat mineral-ammonia fertilizers, used in large quantities in the U.S.S.R., was described in a translation[3] of several technical papers presented in Torfyanaya Promyshlennost, a trade journal of the Soviet peat industry. The process consists, essentially, of spreading mineral fertilizers (phosphate and potash) over the surface of a peat deposit with a specially designed-tractor-drawn machine which distributes the fertilizers over a 16-foot-wide path, embedding these materials in the deposit by disking and rolling the surface, and extracting the peat and mineral components by milled peat methods. After extraction, ammonia water is sprayed into piles of air-dried peat by a machine called an AKU–1 unit. From 10 to 30 kilograms of ammonia water, 15 to 25 kilograms of phosphoric fertilizer, and 6 to 10 kilograms of potash are used for each ton of peat, depending upon the type of peat used and its moisture content and acidity. It was noted that the quantity of nitrogen that can be absorbed by peat increases if superphosphates are used and that losses of nitrogen from the peat are reduced if potassium chloride is used rather than potash. The ultimate amount of nitrogen that can be

[3] Torfyanaya Promyshlennost. (Development of Peat Resources for Fuel in the U.S.S.R., 1 May 1962.) U.S. Dept. of Commerce, Office of Tech. Services, J.P.R.S. 13, 624.

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TABLE 10.—Peat moss imported from Canada and West Germany for consumption in the United States in 1963, by kinds and by customs districts

Customs district	Canada				West Germany			
	Poultry and stable grade		Fertilizer grade		Poultry and stable grade		Fertilizer grade	
	Short tons	Value	Short tons	Value	Short tons	Value	Short tons	Value
Buffalo	39	$1,567	36,205	$1,692,322				
Chicago							494	$15,012
Dakota	2,550	173,795	20,669	868,639				
Duluth and Superior	20	1,966	175	9,472				
Florida							5,602	228,623
Galveston							1,157	46,136
Georgia							141	5,365
Laredo							94	4,350
Los Angeles							1,223	55,992
Maine and New Hampshire	19	585	1,570	68,113				
Maryland					269	$8,921	2,957	134,337
Massachusetts							750	30,225
Michigan	265	12,237	26,183	1,126,367				
Mobile							2,821	117,559
Montana and Idaho	42	1,524	310	14,881				
New Orleans					519	21,425	3,411	133,887
New York			177	6,535	288	17,779	6,929	304,881
North Carolina							55	2,030
Ohio							564	22,204
Oregon							133	5,790
Philadelphia					[1] 133	5,136	4,383	168,789
Puerto Rico							88	5,616
St. Lawrence	306	12,699	24,160	947,626				
San Francisco							453	18,545
South Carolina							653	31,184
Vermont	606	24,106	38,736	1,495,170				
Virginia					64	2,179	1,989	75,964
Washington	288	20,021	58,464	3,809,210				
Wisconsin							202	5,396
Total	4,135	248,500	206,649	10,038,335	[1] 1,273	55,440	34,099	1,411,885

[1] Adjusted by Bureau of Mines.
Source: Bureau of the Census.

absorbed, however, depends entirely upon the type of peat and its acidity; even peat that is extracted from different parts of the same deposit may absorb different amounts of nitrogen.

Substantial quantities of peat briquets are used for domestic and industrial fuel in certain areas of the U.S.S.R., and the Soviets have designed a new method for producing a semibriquet from peat without using binder.[4] The process uses specially-designed equipment that automatically feeds milled peat of 30- to 34-percent moisture content to a grinder-blower that reduces its particle size and then pneumatically conveys the ground peat to bunkers located above briquet presses. Peat then is pressed into irregular pieces called semibriquets having a calorific value of about 6,500 to 6,700 Btu per pound, about 10 percent less than that of standard peat briquets. The moisture content of semibriquests ranges from 20 to 30 percent, compared with 12- or 13-percent moisture in regular peat briquets.

A new method for artifically drying peat has been developed in Ireland. The Peco system,[5] a double-effect pneumatic drying with

[4] Torfyanaya Promyshlennost. (Development of Peat Resources for Fuel in the U.S.S.R., 1 May 1962.) U.S. Dept of Commerce, Office of Tech. Services, J.P.R.S. 13, 624.
[5] Woods, A. Double-Effect Pneumatic Drying of Peat with Steam and Hot Water at Lullymore Briquette Factory, County Kildare, Ireland. Institute Fuel Conference on Drying, Dublin, Ireland. Paper 11, May 27-30, 1963. Fuel Abs. and Current Titles, v. 4, No. 10, October 1963, p. 18.

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steam and water, is a two-stage process analogous to multiple-effect evaporation. The vapor driven off in drying the first effect is recondensed, and its latent heat is used indirectly to carry out further drying. The system is used for drying milled peat for briquetting.

Many attempts have been made to dewater peat by pressure but at present no economical system has been devised. Apparently, colloids in the peat resist pressure and, though a certain amount of water can be pressed out of the sponge-like fibers, the major part remains. Experiments have shown that by freezing peat, colloids can be broken up, but there is no evidence that this would be commercially profitable. Experiments in Scotland also indicate that it is possible to dewater peat by pressure to about 50- or 55-percent moisture content, but no information was available on these studies.

A superior method of analyzing peats by fractionally separating their organic components with sodium pyrophosphate and sulfuric acid has been developed in the U.S.S.R.[6] The first step in separating the various organic fractions requires the extraction of bituminous compounds with benzene and ethyl alcohol, followed by the separation of water-soluble compounds. After these separations, the humic and fulvic acids can be extracted with 0.1 normal sodium pyrophosphate. This treatment removes most of the humic compounds, but final extraction is made with 0.1 normal sodium hydroxide at room temperature. The remaining hemicellulose and cellulose fractions then are extracted separately with different concentrations of sulfuric-acid solutions, and the carbon content of each fraction is determined by Tyurin's method [7] and calculated as a percent of the total initial carbon in the peat sample. Approximately 90 percent of the organic matter in peat can be extracted by a single treatment with sodium-pyrophosphate solution, compared with about 50 percent that is extracted when peat is treated with sodium hydroxide only, under the same conditions. Also, this method is not affected by temperature and does not require a preliminary decalcination of the sample.

A new technical committee for developing standards on peats, mosses, humus, and related products has been established by the American Society for Testing and Materials. ASTM Committee D–29, formed by the Society as a result of requests from producers, users, and suppliers of peat, will direct its efforts toward the stimulation of research, the formulation of definitions and methods of test, and the development of specifications for these products. The initial activities of the committee are being directed toward the preparation of definitions and testing methods for physical properties, including degree of acidity or alkalinity, moisture content, weight per cubic foot, consistency, moisture-holding capacity, and ability to support plant-life. Four permanent subcommittees, (1) Definition and Nomenclature, (2) Methods of Sampling and Testing, (3) Research, and (4) International Liaison, have been established to perform the functions of ASTM Committee D–29.

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[6] Kozakiewicz, Aleksander. Use of Sodium Pyrophosphate for the Fractional Analysis of Peat and Peat Soil Organic Matter. Chemical Abstracts, v. 59, No. 10, sec. 11150, Nov. 11, 1963.

[7] Tyurin, I. V. Method of Analysis for Comparative Study of the Composition of Soil Compost or Humus. Chemical Abstracts, v. 47:2, sec. 5597, Apr. 25–July 25, 1953.

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WORLD REVIEW

Total production of peat for all countries in 1963 was estimated at 169.5 million short tons, the same quantity estimated for 1962. All but 1.1 million tons (less than 1 percent of the total) was produced in Europe.

The U.S.S.R. was the largest producer, with an estimated output of 160.6 million tons, 95 percent of the world total. Of the total Soviet output, it was estimated that 100 million tons was used for agricultural purposes and 60.6 million tons for fuel. Because of a chronic shortage of fuel in certain areas, peat has long been used for fuel in the U.S.S.R., and the Soviets have established a fuel-peat industry that currently supplies an estimated 5 percent of the total industrial fuel consumed in the Soviet Union. Although used for domestic fuel and by various industries, the major use for fuel peat is for generating electric power. Both separate power stations and a number of power grids that supply whole regions and Republics operate entirely on peat.

Faced with persisting food shortages, the U.S.S.R. is producing increasing quantities of peat for agricultural purposes, and production targets call for an output of 130 million tons of milled peat for agricultural use by 1965. Most of this peat will be ammoniated and combined with phosphate and potash to form a peat-fertilizer mix that will be used on farms to help boost Soviet crop output. In addition to agricultural peat, the goal set for 1965 includes 70 million tons of peat for fuel and generating electric power and 20 million tons of peat for animal litter.

Ireland, with 4.1 million tons of peat, ranked second in world production. Peat is used in Ireland principally for electric-power generation and nearly 3 million tons is consumed annually in five peat-fired power stations. Two additional powerplants are under construction and, when completed, the total capacity of power stations fueled by peat will be 427.5 megawatts. Three briquet plants produced 250,000 tons of peat briquets in 1963, and 600,000 bales of peat moss were produced for agricultural uses. Most of the baled peat was exported.

West Germany, the third leading producer, had an output of 1.8 million tons, of which about half was fuel peat and half agricultural peat. Fuel peat was consumed in West Germany principally in producing areas for domestic and industrial heating. Both high-moor and low-moor peats were produced for agricultural use, and some peat was composted with organic wastes and mineral fertilizers before being used for soil-improvement purposes. About 4 percent of the agricultural peat produced in West Germany in 1963 was exported to the United States.

The United States, East Germany, the Netherlands, Sweden, Canada, Norway, the Republic of Korea, and Finland ranked next in output, in the order named. All produced more than 100,000 tons. Several other countries produced small quantities of peat, but no information was available on their outputs. The United States, with 578,530 tons, had the fourth largest output.

Table 11 shows world production of peat, by countries.

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TABLE 11.—World production of peat, by countries [1]

(Thousand short tons)

Country	1959	1960	1961	1962	1963
Argentina, fuel	3	[2] 3	[2] 3	[2] 3	[2] 3
Austria, fuel	39	[2] 40	[2] 40	[2] 40	11
Canada, agricultural use [3]	184	185	224	238	259
Denmark, fuel	463	187	125	67	55
Finland:					
Agricultural use	1	6	4	4	[2] 7
Fuel	151	159	128	99	123
France:					
Agricultural use [2]	31	19	33	31	33
Fuel	3	2	(4)	[2] 3	[2] 3
Germany:					
East [2]	550	550	550	550	550
West:					
Agricultural use	931	895	577	675	[2] 850
Fuel	972	871	830	911	[2] 915
Hungary, agricultural use [2]	65	65	65	65	65
Ireland:					
[5] Agricultural use	13	14	21	24	[2] 22
Fuel	4,805	4,514	3,912	4,198	[2] 4,100
Israel, agricultural use [2]	44	50	55	55	55
Japan [2]	80	80	80	80	80
Korea, Republic of, agricultural use	99	107	45	137	[2] 140
Netherlands [2]	500	500	500	500	440
Norway:					
Agricultural use	55	42	50	40	[2] 45
Fuel	235	198	180	161	115
Poland, fuel	123	125	83	73	[2] 75
Sweden:					
Agricultural use	69	77	[2] 70	[2] 70	[2] 75
Fuel	267	231	[2] 275	[2] 275	[2] 275
U.S.S.R.:					
Agricultural use [2]	100,000	100,000	100,000	100,000	100,000
Fuel	66,700	59,100	57,300	[2] 60,600	[2] 60,600
United States, agricultural use	419	471	531	572	579
World total [2 5]	176,800	168,500	165,700	169,500	169,500
Fuel peat (included in world total) [2 5]	74,040	65,710	63,150	66,710	66,550

[1] Includes revisions of data published previously and estimates for agricultural peat in the U.S.S.R.
[2] Estimate.
[3] In addition, Canada produced a negligible quantity of fuel peat.
[4] Less than 500 tons.
[5] In addition, Iceland, Italy, and Spain produced a negligible quantity of fuel peat.

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Petroleum and Related Products

Carbon Black

By Ivan F. Avery [1]

GENERAL SUMMARY

DOMESTIC production of carbon black in 1963, remained at about the same level as in 1962. Carbon black produced by the furnace process increased 2 percent to 1,880 million pounds in 1963 and accounted for 91 percent of the total output. Channel black production continued to decline and was 14 percent less than a year ago. Shipments during 1963 totaled 2,098 million pounds, a 1 percent increase for the year. An increase of 88 million pounds in domestic sales was partially offset by a decrease of 72 million pounds in carbon black exports.

Total value of carbon black production in 1963 was $148 million. The average value per pound was 7.18 cents or 0.12 cent per pound more than in 1962.

TABLE 1.—Salient statistics of carbon black produced from natural gas and liquid hydrocarbons in the United States, 1959–63

(Thousand pounds)

	1959	1960	1961	1962	1963
Production:					
Channel process	321,030	292,422	262,507	207,438	179,012
Furnace process	1,646,497	1,761,305	1,717,045	1,849,026	1,879,904
Total	1,967,527	2,053,727	1,979,552	2,056,464	2,058,916
Shipments:					
Domestic sales	1,532,249	1,429,618	1,460,005	1,639,897	1,727,420
Exports	513,143	543,047	522,331	442,437	370,928
Total	2,045,392	1,972,665	1,982,336	2,082,334	2,098,348
Losses	4,165	6,973	2,299	370	592
Stocks of producers, December 31	218,893	292,982	287,899	[1] 293,434	253,410
Value:					
Production—thousand dollars	137,983	150,774	144,421	145,256	147,824
Average per pound—cents	7.01	7.34	7.30	7.06	7.18

[1] Revised. No attempt has been made to revise stocks for previous years since data are not available.

[1] Mineral specialist, Division of Statistics, Section of Petroleum.

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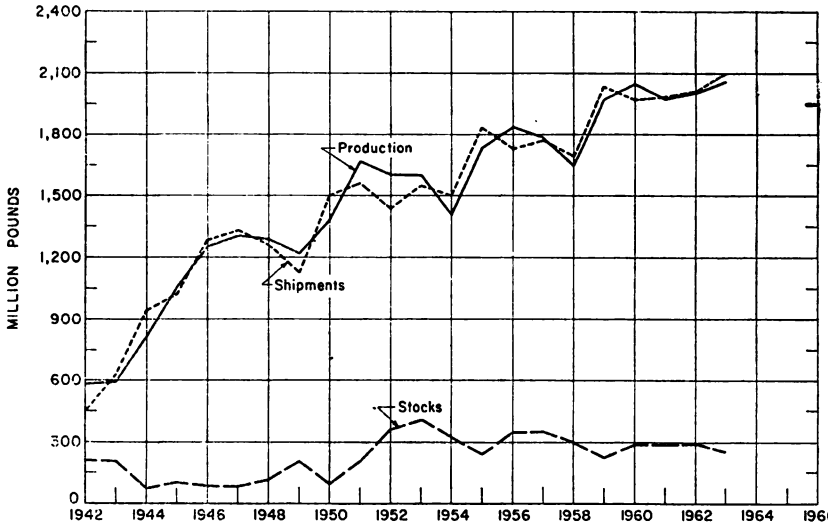

FIGURE 1.—Production, stocks, and shipments of carbon black, 1942–63.

SCOPE OF REPORT

Carbon black is a very pure grade of quasi-graphitic carbon; particle diameters range from 50 to 5,000 angstroms.

Annual reports were submitted to the Bureau of Mines by operators of all commercial plants in the United States.

Monthly figures are based on reports prepared by the National Gas Products Association and are adjusted to agree with the annual reports received by the Bureau of Mines.

Import and export data are compiled by the Bureau of the Census, U.S. Department of Commerce.

Statistics are obtained on both furnace and channel blacks. Furnace blacks are reported in eight grades: Semireinforcing furnace (SRF), high-modulus furnace (HMF), general-purpose furnace (GPF), fast-extrusion furnace (FEF), high-abrasion furnace (HAF), superabrasion furnace (SAF), intermediate-abrasion furnace (ISAF), and thermal. Production and uses of the various grades are described in Minerals Yearbook, 1948 and 1949.

PRODUCTION AND CAPACITY

Production by States.—Output of carbon black in 1963 was 2,059 million pounds, about the same as in 1962. Texas, the major producing State, continued to produce at the same rate as in 1962. The output in Louisiana increased 7 percent in 1963, however, a small quantity of the Louisiana production was concealed by including it in production of Texas in 1962. Texas accounted for 54 percent of the national production, and Louisiana for 32 percent. Arkansas, Oklahoma, California, Kansas, and New Mexico accounted for the remaining 14 percent.

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Output and Shipment by Grades.—Carbon black output by the furnace process was 1,880 million pounds, accounting for 91 percent of the national production. High-abrasion furnace (HAF), and intermediate-abrasion furnace (ISAF) continued to account for about half of total furnace black output. Channel black production continued to decline and was 28 million pounds less than in 1962. Total carbon black shipments, including exports and losses, exceeded production by 39 million pounds, resulting in a decline in stocks during the year.

Number and Capacity of Plants.—The number of channel plants declined by 2 during the year, and at yearend only 39 carbon black plants were operating. The total daily capacity of all operating plants was 7,026,000 pounds, a decline of 24,000 pounds in capacity during the year. Twenty-one plants continued to operate in Texas, accounting for 54 percent of total operating capacity; Louisiana with 9 plants accounted for 27 percent. The remaining 19 percent of capacity was distributed among 9 plants in the other 5 producing States. The channel black plant at Rayville, La., operated by Carbon Blacks, Inc., was closed down, and the Columbian Carbon Co. channel black plant at Eunice, N. Mex., did not operate in 1963.

Method and Yield.—During the year, 117,378 million cubic feet of natural gas was consumed as feedstock to produce 363,915,000 pounds of furnace black (a yield of 11.2 pounds per thousand cubic feet) and 179,012,000 pounds of channel black with an average yield of 2.2 pounds. At furnace black plants, 333,103,000 gallons of liquid hydrocarbon was consumed to produce 1,515,989,000 pounds of carbon black, a yield of 4.6 pounds per gallon. The proportion of furnace black output derived from liquid hydrocarbons was 81 percent.

Until 1961 this proportion steadily rose. During the 1961–63 period this proportion leveled off at about 81 percent.

TABLE 2.—Carbon black produced from natural gas and liquid hydrocarbons in the United States, 1959–63, by States and districts

(Thousand pounds)

State	1959	1960	1961	1962	1963	Change from 1962 (percent)
Louisiana	599,523	[1] 631,488	[1] 582,833	[1] 608,499	649,170	+7
Texas	1,022,796	[1] 1,084,856	[1] 1,070,843	[1] 1,106,874	1,105,189	([2])
Other States	345,208	337,383	325,876	341,091	304,557	−11
Total	1,967,527	2,053,727	1,979,552	2,056,464	2,058,916	([2])

[1] Small quantity of channel black produced in Louisiana included in Texas to avoid disclosure of confidential data.
[2] Less than 0.5 percent.

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TABLE 3.—Production and shipments of carbon black in the United States in 1963, by months and grades

(Thousand pounds)

Month	Furnace									Channel	Total
	SRF[1]	HMF[2]	GPF[3]	FEF[4]	HAF[5]	SAF[6]	ISAF[7]	Thermal	Total		
	PRODUCTION[8]										
January	23,410	2,661	13,624	21,687	41,022	1,779	33,528	15,539	153,250	14,829	168,079
February	21,254	3,906	15,756	19,849	40,957	1,143	31,431	14,824	149,120	14,371	163,491
March	26,402	6,203	15,774	20,252	43,856	391	31,489	17,209	161,576	16,427	178,003
April	26,350	3,074	15,512	17,186	43,135	1,046	33,504	16,589	156,396	16,206	172,602
May	26,584	5,608	17,825	20,210	40,746	443	37,967	17,276	166,659	16,599	183,258
June	26,929	5,868	14,292	20,387	40,800	2,148	33,139	16,290	159,853	14,541	174,394
July	24,252	5,774	14,097	20,553	43,210	517	34,704	16,471	159,578	14,598	174,176
August	22,367	2,926	15,643	16,764	41,491	104	31,072	14,801	145,168	14,260	159,428
September	22,883	6,143	14,069	13,993	40,451	1,694	30,979	14,289	144,501	14,069	158,570
October	26,304	3,798	12,565	19,221	43,848	1,350	33,947	16,403	157,436	14,753	172,189
November	25,045	3,653	12,772	24,378	39,254	351	36,857	17,124	159,434	13,984	173,418
December	28,206	3,523	13,268	22,939	43,368	961	37,889	16,779	166,933	14,375	181,308
Total	299,986	53,137	175,197	237,419	502,138	11,927	406,506	193,594	1,879,904	179,012	2,058,916
	SHIPMENTS (INCLUDING EXPORTS)[9]										
January	24,539	2,619	14,528	20,770	42,357	1,095	32,044	14,311	152,263	11,015	163,278
February	27,333	5,380	15,197	20,296	42,548	1,981	34,325	16,048	163,108	18,201	181,309
March	27,032	5,766	14,930	22,027	43,664	1,324	31,321	16,241	162,305	16,036	178,341
April	26,019	4,952	15,894	21,661	43,775	2,044	37,437	16,899	168,681	15,425	184,106
May	33,360	6,424	22,089	26,900	44,307	1,125	36,638	20,844	191,687	15,276	206,963
June	20,110	4,671	9,801	16,130	35,379	1,869	29,485	14,010	131,455	13,191	144,646
July	22,015	4,113	13,587	18,036	48,930	1,314	36,650	13,535	158,180	12,221	170,401
August	21,874	5,137	14,719	17,042	39,948	916	33,702	15,515	148,853	13,552	162,405
September	23,407	5,057	14,150	16,348	37,992	1,084	31,234	16,790	146,062	13,218	159,280
October	29,065	4,360	15,215	21,507	46,835	1,041	39,750	19,629	177,402	15,243	192,645
November	26,363	4,638	14,968	21,381	43,981	1,253	38,117	19,528	170,229	12,577	182,806
December	25,567	4,176	14,219	20,481	40,516	1,297	34,786	17,500	158,542	14,218	172,760
Total	306,684	57,293	179,297	242,579	510,232	16,343	415,489	200,850	1,928,767	170,173	2,098,940

[1] Semireinforcing furnace.
[2] High-modulus furnace.
[3] General-purpose furnace.
[4] Fast-extrusion furnace.
[5] High-abrasion furnace.
[6] Superabrasion furnace.
[7] Intermediate-abrasion furnace.
[8] Compiled from reports of a consulting engineer of the carbon black industry and of producing companies not included in his figures. Figures adjusted to agree with annual reports of individual producers.
[9] Includes losses.

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TABLE 4.—Number and capacity of carbon black plants operated in the United States, 1962–63

State or district	County or parish	Number of plants				Total daily capacity (pounds)	
		1962		1963		1962	1963
		Channel	Furnace	Channel	Furnace		
Texas:							
Panhandle district	Carson	1	-------	1	-------	1,677,500	1,688,500
	Gray	1	1	1	1		
	Hutchinson	1	4	1	4		
	Moore	-------	1	-------	1		
	Wheeler	-------	1	-------	1		
Total Panhandle district		3	7	3	7	1,677,500	1,688,500
Rest of State	Aransas	1	1	1	1	2,102,500	2,110,500
	Brooks	1	-------	1	-------		
	Ector	1	-------	1	-------		
	Gaines	1	-------	1	-------		
	Harris	-------	1	-------	1		
	Howard	-------	2	-------	2		
	Montgomery	-------	1	-------	1		
	Orange	-------	1	-------	1		
	Terry	-------	1	-------	1		
Total rest of State		4	7	4	7	2,102,500	2,110,500
Total Texas		7	14	7	14	3,780,000	3,799,000
Louisiana	Avoyelles	-------	1	-------	1	1,905,300	1,927,000
	Calcasieu	-------	1	-------	1		
	Evangeline	-------	1	-------	1		
	Ouachita	1	2	-------	2		
	Richland	1	-------	-------	-------		
	St. Mary	-------	3	1	3		
Total Louisiana		2	8	1	8	1,905,300	1,927,000
Arkansas	Union	-------	1	-------	1	1,147,000	1,300,000
California	Contra Costa	-------	1	-------	1		
	Kern	-------	2	-------	2		
Kansas	Grant	-------	2	-------	2		
Oklahoma	Kay	-------	1	-------	1		
New Mexico	Lea	2	1	1	1	217,500	
Total United States		11	30	9	30	7,049,800	7,026,000

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TABLE 5.—Carbon black and the feedstocks used in its production, 1962–63, by States

	Louisiana	Texas	Other States [1]	Total
1962:				
Carbon black production:				
Total—thousand pounds	[2] 608,499	[2] 1,106,874	341,091	2,056,464
Value—thousand dollars	37,816	83,322	24,118	145,256
Average value—cents per pound	6.21	7.53	7.07	7.06
Natural gas used:				
Total—million cubic feet	17,992	84,574	30,736	133,302
Value—thousand dollars	2,455	9,338	3,208	15,001
Average value—cents per thousand cubic feet	13.64	11.04	10.44	11.25
Carbon black produced—thousand pounds	[2] 227,414	[2] 210,211	98,934	536,559
Liquid hydrocarbons used:				
Total—thousand gallons	83,125	191,477	55,797	330,399
Value—thousand dollars	5,965	12,942	3,265	22,172
Average value—cents per gallon	7.18	6.76	5.85	6.71
Carbon black produced—thousand pounds	381,085	896,663	242,157	1,519,905
1963:				
Carbon black production:				
Total—thousand pounds	649,170	1,105,189	304,557	2,058,916
Value—thousand dollars	43,058	83,605	21,161	147,824
Average value—cents per pound	6.63	7.56	6.94	7.14
Natural gas used:				
Total—million cubic feet	21,924	76,750	18,704	117,378
Value—thousand dollars	3,310	8,405	2,677	14,392
Average value—cents per thousand cubic feet	15.10	11.62	14.31	12.70
Carbon black produced—thousand pounds	267,375	201,600	73,952	542,927
Liquid hydrocarbons used:				
Total—thousand gallons	90,135	194,972	47,996	333,103
Value—thousand dollars	6,417	12,856	2,925	22,198
Average value—cents per gallon	7.12	6.59	6.09	6.66
Carbon black produced—thousand pounds	381,795	903,589	230,605	1,515,989

[1] Arkansas, California, Kansas, New Mexico, and Oklahoma.
[2] A small amount of channel black produced in Louisiana is included in Texas to avoid disclosure of confidential data.

TABLE 6.—Natural gas and liquid hydrocarbons used in manufacturing carbon black in the United States and average yield, 1959–63

	1959	1960	1961	1962	1963
Natural gas used—million cubic feet	214,612	197,628	161,377	133,302	117,378
Average yield of carbon black per thousand cubic feet—pounds	3.31	3.23	3.71	4.03	4.63
Average value of natural gas used per thousand cubic feet—cents	9.19	10.05	10.37	11.25	12.70
Liquid hydrocarbons used—thousand gallons	297,639	313,020	307,637	330,399	333,103
Average yield of carbon black per gallon—pounds	4.22	4.52	4.49	4.60	4.55
Average value of liquid hydrocarbons used per gallon—cents	6.74	7.05	7.02	6.71	6.66
Number of producers reporting	11	11	11	10	9
Number of plants	41	42	44	41	39

CONSUMPTION AND USES

Shipments during the year totaled 2,098 million pounds and were 1 percent above those in 1962. An increase of 88 million pounds in domestic sales of carbon black was partially offset by a decline of 72 million pounds in exports.

Domestic sales of carbon black were 1,727 million pounds in 1963, an increase of 5 percent. As in the past, the rubber industry, the principal consumer, accounted for 94 percent of domestic sales, with the remaining 6 percent divided between the ink and paint industries and miscellaneous uses. Included in miscellaneous uses were 7,288,000 pounds reported sold to chemical and food industries, 8,721,000 pounds

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for paper, 8,539,000 pounds for plastics, and 13,488,000 pounds for other miscellaneous uses.

The average loading of carbon black in virgin rubber, which includes both natural and synthetic rubbers, increased to 910 pounds per long ton, compared with 894 pounds in 1962.

TABLE 7.—Carbon black producers of the United States, as of December 31, 1963

State and company	County or parish	Nearest town	Process
Arkansas: Columbian Carbon Co	Union	El Dorado	Furnace.
California:			
Continental Carbon Co	Kern	Bakersfield	Do.
Shell Chemical Co	Contra Costa	Pittsburg	Do.
United Carbon Co	Kern	Mojave	Do.
Kansas:			
Columbian Carbon Co	Grand	Hickok	Do.
United Carbon Co., Inc	do	Ryus	Do.
Louisiana:			
Cabot Corp	Evangeline	Ville Platte	Do.
	St. Mary	Franklin	Do.
Columbian Carbon Co	Avoyelles	Eola	Do.
	Ouachita	Hancock	Do.
	St. Mary	Franklin	Do.
	do	do	Channel.
Continental Carbon Co	Calcasieu	Westlake	Furnace.
Thermatomic Carbon Co	Ouachita	Monroe	Do.
United Carbon Co., Inc	St. Mary	Franklin	Do.
New Mexico:			
Continental Carbon Co	Lea	Eunice	Do.
United Carbon Co., Inc	do	do	Channel.
Oklahoma: Continental Carbon Co	Kay	Ponca City	Furnace.
Texas:			
Cabot Corp	Carson	Skellytown	Channel.
	Gray	Pampa	Furnace.
	Howard	Big Springs	Do.
Columbian Carbon Co	Gaines	Seagraves	Channel.
	Gray	Lefors	Do.
	Montgomery	Conroe	Furnace.
	Terry	Seagraves	Do.
Continental Carbon Co	Moore	Sunray	Do.
J. M. Huber Corp	Harris	Baytown	Do.
	Hutchinson	Borger	Do.
	do	do	Channel.
Phillips Chemical Co	do	do	Furnace.
	do	do	Do.
	do	do	Do.
	Orange	Orange	Do.
Sid Richardson Carbon Co	Ector	Odessa	Channel.
	Howard	Big Spring	Furnace.
United Carbon Co., Inc	Aransas	Aransas Pass	Channel.
	do	do	Furnace.
	Brooks	Falfurrias	Channel.
	Wheeler	Shamrock	Furnace.

TABLE 8.—Sales of carbon black for domestic consumption in the United States 1959–63, by uses

(Thousand pounds)

Uses	1959	1960	1961	1962	1963	Change from 1962 (percent)
Rubber	1,463,239	1,362,912	1,382,893	1,551,204	1,629,905	+5
Ink	47,366	47,980	42,987	41,162	46,471	+13
Paint	13,828	12,270	15,267	15,766	13,008	−17
Miscellaneous	7,816	6,456	18,858	31,765	38,036	+20
Total	1,532,249	1,429,618	1,460,005	1,639,897	1,727,420	+5

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STOCKS

Total stocks of carbon black for 1962 were revised because of a change in one company's reporting procedure. No attempt was made to revise data for earlier years. Total stocks decreased 40 million pounds in 1963. Stocks of furnace black declined about 49 million pounds and stocks of channel black increased 9 million pounds. All grades of furnace black stocks decreased during 1963.

TABLE 9. Producers' stock of channel- and furnace-type blacks in the United States, December 31, 1959–63

(Thousand pounds)

Year	Furnace									Channel	Total
	SRF [1]	HMF [1]	GPF [1]	FEF [1]	HAF [1]	SAF [1]	ISAF [1]	Thermal	Total		
1959	24,917	4,757	4,132	18,413	40,281	6,786	29,044	20,800	149,130	69,763	218,893
1960	43,402	12,050	7,827	23,420	66,325	4,437	39,075	23,032	219,568	73,424	292,992
1960 [2]	43,402	11,040	8,827	23,420	66,325	4,437	39,075	23,032	219,558	73,424	292,982
1961	41,171	7,694	9,055	22,069	69,799	8,510	62,728	16,229	237,255	50,644	287,899
1962 [3]	38,509	12,046	24,619	28,507	68,470	8,939	58,471	13,575	253,136	40,298	293,434
1963	31,811	7,890	20,519	23,347	60,376	4,523	49,488	6,319	204,273	49,137	253,410

[1] For explanation, see footnotes to table 3.
[2] Reclassification of grades.
[3] Revised. No attempt has been made to revise stocks for previous years since data are not available.

VALUE

The average value of furnace black f.o.b. plants, increased slightly from 6.55 cents per pound in 1962 to 6.65 cents in 1963. Value of channel black increased from 11.64 cents per pound to 12.73 cents per pound in 1963. Average value of natural gas used as feedstock in carbon black production rose 1.45 cents per thousand cubic feet to 12.70 cents, while the value of liquid hydrocarbons used, decreased from 6.71 cents in 1962 to 6.66 in 1963. Prices of furnace black sold in bags were increased 0.25 cent per pound on June 3, 1963, following the 0.25 increase in price of channel black in bags on January 14, 1963, which was reported by the Oil, Paint, and Drug Reporter.

TABLE 10.—Prices of carbon black in carlots, f.o.b. plant, 1959–63

(Cents per pound)

Date	Channel blacks, ordinary rubber grades [1]		Furnace blacks (bags)			
	Bags	Bulk	Semireinforcing grades (SRF)	High-modulus grades (HMF)	Fast-extrusion grades (FEF)	High-abrasion grades (HAF)
December 28, 1959	7.75	7.25	5.75	6.25	6.75	7.75
February 8, 1960	8.50	8.00	5.75	6.25	6.75	7.75
October 17, 1960	8.50	8.00	5.75	6.25	8.75	7.75
April 10, 1961	8.50	8.00	5.75	8.25	8.75	7.75
October 9, 1961	8.50	8.00	5.75	6.25	6.75	7.75
February 5, 1962	9.00	8.75	5.75	6.25	6.75	7.75
May 14, 1962	9.00	8.75	5.50	6.00	6.50	7.50
January 14, 1963	9.25	8.75	5.50	6.00	6.50	7.50
June 3, 1963	9.25	8.75	5.75	6.25	6.75	7.50

[1] Chiefly easy-processing (EPC) and medium-processing (MPC), but also includes hard-processing (HPC) and conductive (CC) channel blacks.

Source: Oil, Paint and Drug Reporter.

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EXPORTS

Total exports of carbon black continued a downward trend in 1963. Exports decreased 71,590,000 pounds to 370,928,000 pounds. Furnace black exports were down 40,199,000 pounds from the 1962 level and channel black exports also were down 31,310,000 pounds. The decline in exports during the past 3 years was due to the expanded production in foreign countries.

TABLE 11.—U.S. exports of carbon black, 1963, by months

(Thousand pounds)

Month	Channel	Furnace	Total	Month	Channel	Furnace	Total
January	2,443	8,224	10,667	August	6,054	23,985	30,039
February	7,984	28,825	36,809	September	5,996	25,161	31,157
March	8,802	29,089	37,891	October	5,600	24,757	30,357
April	7,684	28,922	36,606	November	6,369	26,206	32,575
May	7,335	25,296	32,631	December	7,094	20,361	27,455
June	5,412	26,496	31,908				
July	4,704	28,129	32,833	Total: 1963	75,477	295,451	370,928
				1962	115,676	326,761	442,437

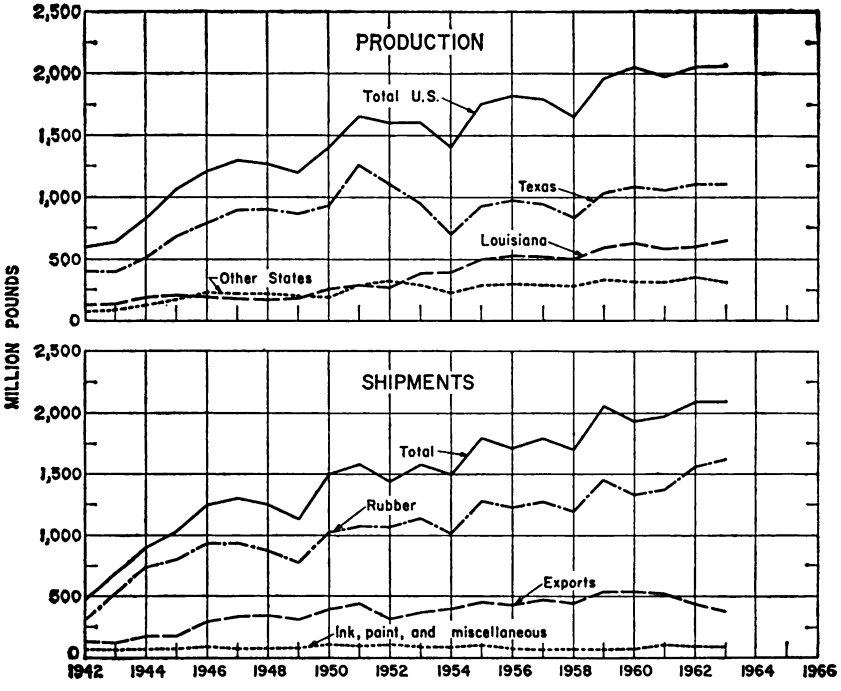

FIGURE 2.—Production and shipments of carbon black, 1942–63.

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TABLE 12.—U.S. exports of carbon black, by countries

Destination	1961		1962		1963	
	Thousand pounds	Thousand dollars	Thousand pounds	Thousand dollars	Thousand pounds	Thousand dollars
North America:						
Canada	19,722	1,712	25,540	2,177	29,286	2,435
Guatemala	815	71	701	62	1,482	128
Mexico	20,273	1,652	24,245	1,920	18,880	1,581
Other North America	72	10	16	4	114	10
Total	40,882	3,445	50,502	4,163	49,742	4,154
South America:						
Argentina	29,798	2,634	24,974	2,133	5,967	533
Brazil	12,021	1,011	12,777	1,022	6,600	578
Chile	3,361	299	2,926	255	5,273	488
Colombia	8,057	721	9,535	848	11,143	995
Peru	3,858	344	3,890	336	3,964	344
Uruguay	1,227	105	2,094	184	2,157	184
Venezuela	11,100	1,006	9,979	865	2,188	201
Other South America	464	46	237	22	1,332	121
Total	69,886	6,166	66,412	5,665	38,624	3,444
Europe:						
Austria	2,032	157	2,097	160	1,728	131
Belgium-Luxembourg	12,899	1,173	8,890	808	4,457	430
Czechoslovakia	1,091	101	110	11	4,616	410
Denmark	3,552	323	1,506	194	1,159	177
Finland	1,329	118	1,571	144	852	82
France	55,215	5,242	48,474	4,842	33,905	3,574
Germany, West	51,184	4,331	48,543	4,120	39,445	3,242
Greece	505	43	394	31	563	45
Ireland	25	3	128	21	88	13
Italy	65,528	5,887	47,206	4,369	32,746	3,194
Netherlands	8,246	818	8,089	796	6,738	647
Norway	2,076	187	1,781	159	1,382	129
Poland and Danzig	13	2	4	1	375	32
Portugal	2,290	211	1,744	169	2,229	211
Spain	8,189	735	5,921	582	3,129	376
Sweden	10,693	1,005	6,780	622	4,161	377
Switzerland	3,554	347	1,440	157	1,593	159
Trieste	198	15	67	5		
U.S.S.R.	9,370	828			18,631	1,602
United Kingdom	26,155	3,361	23,576	3,180	19,418	2,780
Yugoslavia	4,664	414	1,577	159	1,678	230
Other Europe	45	4	84	14	43	4
Total	268,853	25,305	209,982	20,544	178,936	17,845
Asia:						
India	31,400	2,669	39,409	3,300	30,948	2,575
Indonesia	7,143	649	2,822	[1] 235	6,448	561
Iran	1,635	142	1,037	87	1,253	120
Israel	4,738	395	5,685	477	3,145	267
Japan	41,574	4,325	18,241	2,162	10,117	1,617
Korea, Republic of	2,873	272	6,048	573	3,356	302
Malaya, Federation of	1,248	116	1,083	102	1,232	105
Singapore	534	50	427	41	381	36
Pakistan	705	66	648	61	699	70
Philippines	7,587	695	7,462	673	9,357	843
Taiwan	1,407	126	2,646	234	1,310	115
Turkey	1,305	112	2,977	240	3,833	339
Other Asia	2,733	280	1,905	201	3,124	311
Total	104,882	9,897	90,390	[1] 8,386	75,203	7,261
Africa:						
South Africa, Republic of	20,812	1,840	11,860	1,002	15,330	1,510
United Arab Republic (Egypt Region)	2,303	205	62	6	2,333	214
Other Africa	873	84	977	96	771	72
Total	23,988	2,129	12,899	1,104	18,434	1,796
Oceania:						
Australia	8,473	750	8,615	854	6,588	636
New Zealand	5,367	474	3,637	320	3,401	311
Total	13,840	1,224	12,252	1,174	9,989	947
Grand total	522,331	48,166	442,437	[1] 41,036	370,928	35,447

[1] Revised figure.

Source: Bureau of the Census.

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WORLD PRODUCTION

TABLE 13.—World production of carbon black by countries [1 2]

(Thousand pounds)

Country [1]	1959	1960	1961	1962	1963
Argentina				(3)	12,820
Brazil	25,353	35,274	37,467	43,430	54,784
France	68,800	[4] 77,000	[4] 154,300	[4] 278,000	(3)
Germany, West	139,582	154,878	173,462	201,549	[4] 212,200
Italy	4,627	17,637	4,896	4,482	[4] 32,000
Japan	42,300	55,093	93,936	147,025	161,917
Rumania	49,235	55,186	62,589	65,082	73,142
South Africa, Republic of			4,123	16,840	21,402
Sweden	7,430	(3)	(3)	(3)	(3)
Taiwan	455	310	676	453	425
United Kingdom	271,400	322,500	301,000	281,700	279,900
United States	1,967,527	2,053,727	1,979,552	2,056,464	2,058,916
Yugoslavia	6,440	8,514	9,696	8,234	8,814

[1] Australia, China, India, Mexico, Netherlands, and Venezuela produce carbon black but production data are not available. Canada's carbon black capacity was increased late in 1961 to about 100 million pounds annually, from two producers. Actual production is not published to avoid disclosure of individual company data.

[2] This table incorporates some revisions.

[3] Data not available.

[4] Estimate.

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Natural Gas

By Ivan F. Avery [1]

Contents

	Page		Page
General summary	337	Interstate shipments, imports and exports	343
Scope of report	338	Disposition of residue gas from processing plants	344
Reserves	338	Consumption	348
Gross withdrawal	338	Value and price	356
Underground storage of natural gas	339	World production	357
		Technology	358

GENERAL SUMMARY

THE NATURAL gas industry continued to maintain record production levels in 1963. Marketed production reached 14,747 billion cubic feet, which was the highest output on record and 6 percent more than the 13,877 billion cubic feet produced in 1962.

Natural gas was consumed in all States except Maine, Hawaii, and Vermont. Total consumption in 1963 was 14,640 billion cubic

TABLE 1.—Salient statistics of natural gas in the United States

	1959	1960	1961	1962	1963
Supply:					
Marketed production [1] million cubic feet	12,046,115	12,771,038	13,254,025	13,876,622	14,746,663
Withdrawn from storage do	668,743	712,658	698,050	854,336	916,720
Imports do	133,990	155,646	218,860	401,534	406,204
Total do	12,848,848	12,639,342	14,170,935	15,132,492	16,069,587
Disposition:					
Consumption do	11,819,638	12,509,427	13,081,714	13,890,129	14,640,480
Exports do	18,413	11,332	10,747	15,814	16,957
Stored do	787,485	844,352	843,666	940,823	1,047,492
Lost in transmission, etc do	223,312	274,231	234,808	285,726	364,658
Total do	12,848,848	13,639,342	14,170,935	15,132,492	16,069,587
Value at wellhead:					
Total thousand dollars	1,556,800	1,789,970	1,996,241	2,145,301	2,328,030
Average cents per Mcf	12.9	14.0	15.1	15.5	15.8

[1] Comprises gas sold or consumed by producers, including losses in transmission, amounts added to storage, and increases in gas in pipelines.

[1] Supervisory mineral specialist (petroleum), Division of Statistics.

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feet, an increase of 5 percent over the 13,890 billion cubic feet consumed in 1962. Natural gas stored in underground reservoirs in 1963 increased by 130 billion cubic feet compared to the 86 billion cubic feet added in 1962. The average value at the wellhead was 15.8 cents per thousand cubic feet, 0.3 cent per thousand more than in 1962.

At point of consumption the average value in 1963 was 51.2 cents per thousand cubic feet, a decline of 0.2 cent compared with the previous year. Pipeline data usually shown in this chapter are not available at this time.

SCOPE OF REPORT

Data on natural gas production, consumption, and value are collected by annual questionnaires sent to oil and gas producers, natural-gasoline-plant operators, gas-pipeline companies, and gas-utility companies. A separate report was filed by the respondent for each State in which he operated.

Volumes are reported at the pressure base selected by the reporting company; however, if the reported pressure base deviates more than 5 percent from 14.65 pounds per square inch absolute (psia) at 60° F, volumes are corrected to this base.

Reports are received covering approximately 75 percent of the gross natural gas production. The large number of respondents and the difficulty of contacting each small producer make direct compilation of total production impractical. The bulk of the output of nonreporting producers is shown in purchase listings of reporting companies. Marketed production for each State equals consumption in the State, plus gas placed in storage, plus shipments to other States, less gas withdrawn from storage, less receipts from other States.

RESERVES

Proven reserves of natural gas in 1963 totaled 276.2 trillion cubic feet, 2.4 trillion more than 1962, according to the American Gas Association Committee on Natural Gas Reserves. Nonassociated gas constituted 72.9 percent of the total reserves; associated gas, dissolved gas and quantities in underground storage represented 15.6, 10.5, and 1.0 percent, respectively. Reserves of natural gas are located in 31 States. Five States, in descending order, Texas, Louisiana, Oklahoma, Kansas, and New Mexico, account for approximately 89 percent of the total reserves in the United States. Proven reserves of natural gas in 1963 were compiled on 14.73 psia pressure base instead of 14.65 psia used in prior years.

GROSS WITHDRAWAL

Gross withdrawal figure represents the sum of marketed production, which comprises gas sold or consumed by producers, including extraction losses, lost in transmission, amount added to storage, and increases in gas pipelines, gas repressured, which includes that returned to formations, pressure maintenance and cycling; and gas vented

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and flared. The quantity of gas vented and flared is compiled from company data reported to the Bureau of Mines and is supplemented by estimates of losses derived from figures published by the Natural Gas Reserves Committee of the American Gas Association and State conservation bodies.

Gross withdrawal of natural gas in 1963 was 16,973 billion cubic feet, an increase of 6 percent over the 16,039 billion cubic feet reported in 1962. Repressuring increased 6 percent to 1,843 billion cubic feet and vented and flared decreased 10 percent to 383 billion cubic feet.

UNDERGROUND STORAGE OF NATURAL GAS

Gross injections to underground storage in 24 States in 1963 were 1,047 billion cubic feet, while withdrawals from the same areas totaled 917 billion cubic feet. The resulting net increase in storage was 130 billion cubic feet during the year.

The American Gas Association reports that 20 storage pools and 967 no-longer-producing wells were added to existing underground storage facilities, thus increasing the reservoir capacity 169 billion cubic feet during 1963.

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TABLE 2.—Estimated proved recoverable reserves of natural gas in the United States

(Million cubic feet at 14.73 psia at 60° F)

State	Reserves as of Dec. 31, 1962 [1]	Changes in reserves during 1963			
		Extensions and revisions [1]	Discoveries of new fields and new pools in old fields [1]	Net change in underground storage [2]	Net production [3]
Alaska	1,634,321	60,432	500	0	4,529
Arkansas	1,643,669	111,486	109,106	11,030	82,647
California [4]	9,121,385	225,650	106,105	26,795	614,209
Colorado	2,204,777	−260,472	23,782	2,923	94,953
Illinois	158,213	−6,431	249	23,942	7,378
Indiana	49,638	3,875	199	10,077	3,609
Kansas	18,567,174	124,893	85,356	1,257	784,445
Kentucky	1,108,942	34,576	10,409	−332	68,359
Louisiana [4]	71,544,088	6,245,918	1,790,102	591	4,215,707
Michigan	647,039	10,352	2,115	96,315	33,009
Mississippi	2,735,845	−104,986	50,330	100	199,662
Montana	600,171	10,509	1,874	13,222	27,645
Nebraska	100,194	1,893	656	10,343	13,044
New Mexico	14,112,734	1,562,784	91,322	−14,370	714,648
New York	131,196	2,253	1,361	988	3,513
North Dakota	962,709	188,687	1,491	0	33,312
Ohio	727,912	32,394	17,790	8,591	38,500
Oklahoma	18,259,036	1,620,670	382,325	4,921	1,128,132
Pennsylvania	1,175,083	74,930	16,255	40,570	92,340
Texas [4]	118,854,773	2,286,825	2,796,001	2,174	6,130,397
Utah	1,786,366	−99,739	20,136	248	68,687
Virginia	33,045	330	0	0	2,072
West Virginia	2,025,999	425,900	43,053	2,119	185,907
Wyoming	3,931,224	242,806	27,417	−955	211,946
Other States [5]	163,325	7,439	0	13,184	3,616
Total	272,278,858	12,802,974	5,577,934	253,733	14,762,266

State	Reserves as of Dec. 31, 1963				
	Non-associated [6]	Associated [7]	Dissolved [8]	Underground storage [9]	Total
Alaska	1,626,290	0	64,434	0	1,690,724
Arkansas	1,331,319	266,282	178,455	16,588	1,792,644
California [4]	3,140,246	1,708,976	3,825,882	190,622	8,865,726
Colorado	1,509,657	99,939	262,209	4,252	1,876,057
Illinois	80	0	41,434	127,081	168,595
Indiana	696	686	17,665	41,133	60,180
Kansas	17,241,316	494,664	168,013	90,242	17,994,235
Kentucky	979,238	0	70,352	35,646	1,085,236
Louisiana [4]	61,759,903	8,643,963	4,960,535	591	75,364,992
Michigan	112,403	80,472	58,452	471,485	722,812
Mississippi	1,988,655	195,205	291,795	5,972	2,481,627
Montana	399,266	22,624	80,934	95,307	598,131
Nebraska	65,074	6,797	17,828	10,343	100,042
New Mexico	10,868,323	2,326,626	1,816,952	25,921	15,037,822
New York	40,869	0	31	91,385	132,285
North Dakota	6,955	338,531	774,089	0	1,119,575
Ohio	273,761	0	98,426	376,000	748,187
Oklahoma	14,301,295	2,681,100	2,023,291	133,134	19,138,820
Pennsylvania	704,026	0	19,241	491,231	1,214,498
Texas [4]	78,449,748	25,771,799	13,515,098	72,731	117,809,376
Utah	978,846	404,312	254,378	788	1,638,324
Virginia	31,303	0	0	0	31,303
West Virginia	1,930,259	0	60,802	320,103	2,311,164
Wyoming	3,441,002	138,922	387,207	21,415	3,988,546
Other States [5]	39,119	0	18,530	122,683	180,332
Total	201,219,649	43,180,898	29,006,033	2,744,653	276,151,233

[1] Excludes gas loss due to natural gas liquids recovery.

[2] Net difference between gas stored in and gas withdrawn from underground storage reservoirs, including adjustments and native gas transferred from other reserves catagories.

[3] Net production equals gross withdrawal less gas injected into producing reservoirs. Changes in underground storage and gas loss due to natural gas liquids recovery are excluded. Fourth quarter production estimated in some instances.

[4] Includes offshore reserves.

[5] Includes Alabama, Arizona, Florida, Iowa, Maryland, Missouri, and Tennessee.

[6] Free gas not in contact with oil, where production of such gas is not significantly affected by production of crude oil.

[7] Free gas in contact with crude oil in reservoirs where production of such gas is significantly affected by production of crude oil.

[8] Gas in solution with crude oil in reservoirs.

[9] Gas held in underground reservoirs (including native and net-injected gas) for storage purposes.

Source: Committee on Natural Gas Reserves, American Gas Association.

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TABLE 3.—Gross withdrawals and disposition of natural gas in the United States

(Million cubic feet)

State	Gross withdrawals [1]			Disposition		
	From gas wells	From oil wells	Total	Marketed production [2]	Repressuring	Vented and flared [3]
1962:						
Alaska	1,800	2,000	3,800	2,184	265	1,351
Arkansas	62,000	41,600	103,600	66,213	35,315	2,072
California	215,500	652,000	867,500	564,220	291,025	12,255
Colorado	58,200	80,800	139,000	101,826	33,194	3,980
Illinois	2,000	12,200	14,200	10,650		3,550
Indiana	300	3,300	3,600	284		3,316
Kansas	680,100	60,000	740,100	694,352	171	45,577
Kentucky	67,200	3,100	70,300	70,241		59
Louisiana	3,124,000	730,000	3,854,000	3,525,456	221,167	107,377
Maryland	2,472		2,472	2,472		
Michigan	18,800	10,500	29,300	28,987	146	167
Mississippi	133,700	91,300	225,000	170,271	48,227	6,502
Montana	24,700	8,100	32,800	29,955	561	2,284
Nebraska	8,600	7,400	16,000	14,880		1,120
New Mexico	523,200	293,600	816,800	804,612	7,780	4,408
New York	4,100	200	4,300	4,262		38
North Dakota	1,000	30,500	31,500	25,155	2,974	3,371
Ohio	32,400	5,000	37,400	36,747		653
Oklahoma	725,800	496,100	1,221,900	1,060,717	79,065	82,118
Pennsylvania	89,100	3,100	92,200	90,053	76	2,071
Texas	5,551,500	1,647,300	7,198,800	6,080,210	989,066	129,524
Utah	25,500	64,100	89,600	74,128	11,972	3,500
Virginia	2,499		2,499	2,499		
West Virginia	207,400	3,500	210,900	210,698	80	122
Wyoming	140,100	90,700	230,800	204,996	15,638	10,166
Other States [4]	411	191	602	554		48
Total	11,702,382	4,336,591	16,038,973	13,876,622	1,736,722	425,629
1963:						
Alaska	8,100	2,800	10,900	4,498	6,316	86
Arkansas	57,700	41,500	99,200	76,101	19,191	3,908
California	281,200	668,300	949,500	646,486	297,413	5,601
Colorado	65,400	79,500	144,900	105,705	35,070	4,125
Illinois	1,900	7,700	9,600	9,459		141
Indiana	300	3,300	3,600	286		3,314
Kansas	718,000	50,000	768,000	732,946	155	34,899
Kentucky	71,700	3,000	74,700	74,634		66
Louisiana	3,540,100	710,000	4,250,100	3,928,427	212,116	109,557
Maryland	1,633		1,633	1,633		
Michigan	25,200	10,400	35,600	32,850	1,640	1,110
Mississippi	138,100	92,100	230,200	176,807	45,368	8,025
Montana	23,400	8,000	31,400	30,026	598	776
Nebraska	8,200	6,100	14,300	13,051		1,249
New Mexico	528,000	298,400	826,400	808,377	11,814	6,209
New York	3,800	200	4,000	3,962		38
North Dakota	1,100	38,800	39,900	32,798	3,034	4,068
Ohio	33,500	5,000	38,500	36,817		1,683
Oklahoma	850,900	496,100	1,347,000	1,233,883	62,203	50,914
Pennsylvania	90,200	3,000	93,200	92,657	204	339
Texas	5,769,300	1,683,000	7,452,300	6,205,034	1,114,288	132,978
Utah	26,600	67,000	93,600	77,122	13,771	2,707
Virginia	2,085		2,085	2,085		
West Virginia	207,000	3,400	210,400	210,223	116	61
Wyoming	151,000	89,500	240,500	209,060	20,000	11,440
Other States [4]	1,604	246	1,850	1,736		114
Total	12,606,022	4,367,346	16,973,368	14,746,663	1,843,297	383,408

[1] Marketed production plus quantities used in repressuring, vented, and flared.
[2] Comprises gas sold or consumed by producers, including losses in transmission, quantities added to storage and increases in gas in pipelines.
[3] Partly estimated: Includes direct losses on producing properties and residue blown to the air.
[4] Alabama, Arizona, Florida, Missouri, South Dakota, and Tennessee.

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TABLE 4.—Marketed production of natural gas in the United States [1]

State	Quantity (million cubic feet)					Change from 1962 (percent)	Estimated value at wells (thousand dollars)	
	1959	1960	1961	1962	1963		1962	1963
Alabama	172	57	56	128	177	38.3	13	21
Alaska	133	246	631	2,184	4,498	106.0	467	1,111
Arizona				230	1,334	480.0	27	161
Arkansas	40,674	55,451	59,547	66,213	76,101	14.9	9,866	11,796
California	485,655	517,535	556,241	564,220	646,486	14.6	163,624	189,420
Colorado	99,899	107,404	108,142	101,826	105,705	3.8	11,812	12,367
Florida	34	30	29	29	35	20.7	6	7
Illinois	13,739	11,666	9,970	10,650	9,459	−11.2	1,523	1,220
Indiana	484	342	382	284	286	0.7	60	67
Kansas	604,410	634,410	649,083	694,352	732,946	5.6	86,100	97,482
Kentucky	73,504	75,329	70,937	70,241	74,634	6.3	17,419	17,838
Louisiana	2,670,271	2,988,414	3,271,857	3,525,456	3,928,427	11.4	694,515	777,829
Maryland	4,373	4,065	3,578	2,472	1,633	−33.9	667	439
Michigan	18,916	20,790	27,697	28,987	32,850	13.3	6,174	8,902
Mississippi	162,095	172,478	172,543	170,271	176,807	3.8	32,351	31,825
Missouri		75	90	92	100	8.7	23	27
Montana	30,743	33,418	33,901	29,955	30,026	0.2	2,217	2,253
Nebraska	13,128	15,258	15,743	14,880	13,051	−12.3	2,708	2,454
New Mexico	739,660	798,928	789,662	804,612	808,377	0.5	92,530	96,197
New York	2,915	4,990	5,742	4,262	3,962	−7.0	1,198	1,169
North Dakota	17,915	19,483	20,100	25,155	32,798	30.4	3,446	6,264
Ohio	34,664	36,074	36,423	36,747	36,817	0.2	9,407	8,909
Oklahoma	811,508	824,266	892,697	1,060,717	1,233,883	16.3	135,772	160,405
Pennsylvania	90,366	113,928	100,427	90,053	92,657	2.9	24,494	24,091
Tennessee	52	63	71	75	90	20.0	14	17
Texas	5,718,993	5,892,704	5,963,605	6,080,210	6,205,034	2.1	747,866	775,629
Utah	38,921	51,040	57,175	74,128	77,122	4.0	12,454	14,036
Virginia	2,280	2,227	2,466	2,499	2,085	−16.6	677	488
West Virginia	204,633	208,757	210,556	210,698	210,223	−0.2	57,942	55,919
Wyoming	156,978	181,610	194,674	204,996	209,060	2.0	29,929	29,687
Total	12,046,115	12,771,038	13,254,025	13,876,622	14,746,663	6.3	2,145,301	2,328,030

[1] Comprises gas either sold or consumed by producers, including losses in transmission, quantities added to storage, and increases of gas in pipelines.

TABLE 5.—Natural gas stored underground in and withdrawn from storage fields

(Million cubic feet)

State	1962			1963		
	Total stored	Total withdrawn	Net stored	Total stored	Total withdrawn	Net stored
Arkansas	1,656	199	1,457	1,728	1,037	691
California	64,025	32,459	31,566	73,556	46,768	26,788
Colorado	1,508	1,139	369	2,220	851	1,369
Delaware	226	206	20	401	329	72
Illinois	44,170	32,749	11,421	69,954	57,078	12,876
Indiana	14,132	7,362	6,770	22,516	12,841	9,675
Iowa	29,418	22,628	6,790	33,777	25,379	8,398
Kansas	44,152	34,847	9,305	40,791	40,353	438
Kentucky	18,016	19,311	−1,295	18,863	19,000	−137
Michigan	157,721	154,349	3,372	153,008	128,651	24,357
Mississippi	3,282	2,590	692	3,567	3,467	100
Missouri	8,891	4,571	4,320	10,093	7,179	2,914
Montana	14,444	4,672	9,772	18,529	5,594	12,935
Nebraska	398	182	216	457	716	−259
New Mexico	5,073	6,003	−930	5,414	7,354	−1,940
New York	39,437	39,670	−233	43,223	42,297	926
Ohio	125,023	128,530	−3,507	138,757	127,029	11,728
Oklahoma	29,299	17,784	11,515	30,435	26,067	4,368
Pennsylvania	178,370	183,172	−4,802	195,513	194,890	623
Texas	22,409	18,244	4,165	26,313	25,244	1,069
Utah	733	694	39	1,284	1,088	196
Virginia		7	−7		16	−16
West Virginia	135,159	140,477	−5,318	154,297	140,325	13,972
Wyoming	3,281	2,491	790	2,796	3,167	−371
Total	940,823	854,336	86,487	1,047,492	916,720	130,772

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TABLE 6.—Underground storage statistics, December 31, 1963

State	Number of pools	Number of active wells	Total gas in storage reservoirs (million cubic feet)	Total reservoir capacity (million cubic feet)
Arkansas	5	25	16,588	16,751
California	6	141	190,622	281,757
Colorado	2	19	4,252	7,806
Illinois	12	493	127,081	254,664
Indiana	19	557	41,133	49,170
Iowa	4	140	100,173	154,390
Kansas	16	741	90,242	103,359
Kentucky	13	537	35,646	42,136
Louisiana	1	4	591	650
Michigan	25	1,769	471,484	515,386
Mississippi	2	23	5,972	6,410
Missouri	2	59	22,510	69,146
Montana	5	157	95,308	155,377
Nebraska	1	7	10,343	39,270
New Mexico	3	35	25,921	57,802
New York	15	712	91,385	107,025
Ohio	18	2,543	376,000	447,250
Oklahoma	9	102	133,135	251,504
Pennsylvania	69	2,078	491,230	592,899
Texas	11	109	72,731	89,345
Utah	1	9	788	911
West Virginia	37	1,219	320,103	368,288
Wyoming	2	9	21,415	62,628
Total	278	11,488	2,744,653	3,673,924

Source: American Gas Association.

TABLE 7.—Gas wells and condensate wells in the United States

State	Drilled during 1962 [1]	Producing Dec. 31, 1962	Drilled during 1963 [1]	Producing Dec. 31, 1963
Alabama				2
Alaska	5	8	5	10
Arizona	9	3	2	7
Arkansas	48	480	43	490
California	163	826	118	879
Colorado	89	451	93	501
Illinois	11	30	12	25
Indiana	7	290	8	235
Kansas	232	6,915	227	7,050
Kentucky	223	5,200	167	5,210
Louisiana	724	7,442	614	7,859
Maryland		33		33
Michigan	71	174	84	175
Mississippi	26	490	22	450
Missouri		6		6
Montana	19	954	15	905
Nebraska	5	47	1	44
New Mexico	421	6,967	281	7,150
New York	43	1,130	22	1,130
North Dakota		29		31
Ohio	261	7,117	217	7,128
Oklahoma	572	6,324	430	6,639
Pennsylvania	271	16,600	220	16,600
Tennessee	3	30		30
Texas	1,546	20,834	1,308	22,016
Utah	53	121	21	135
Virginia	10	98	2	98
West Virginia	952	17,121	791	17,500
Wyoming	84	547	53	578
Total	5,848	100,267	4,756	102,966

[1] Source: Oil and Gas Journal.

INTERSTATE SHIPMENTS, IMPORTS AND EXPORTS

New levels have been attained each year since the first year that data were compiled for interstate movements of natural gas. Interstate shipments, including exports and imports, were 9,089 billion

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cubic feet, an increase of 8 percent over the 8,418 billion cubic feet shipped in 1962. West south central region furnished 73 percent of these shipments, the same level as in 1962.

Movements of natural gas to and from the United States, Canada, and Mexico remained at about the same level as 1962. Natural gas imported from Canada in 1963 totaled 356 billion cubic feet, and 7 billion cubic feet were shipped to Canada. Mexico shipped 50 billion cubic feet to the United States, and received 10 billion cubic feet in return.

DISPOSITION OF RESIDUE GAS FROM GAS PROCESSING PLANTS

The disposition of residue gas and volume of gas loss (shrinkage) by the extraction of natural gas liquids, by States, are reported in table 5 of the natural gas liquids chapter in this volume. In 1963 there were 12,340 billion cubic feet of gas processed in the United States, producing 16,837 million gallons of natural gas liquids. The shrinkage of gas due to this operation was 670 billion cubic feet in 1963 compared to 624 billion in 1962. These volumes are included in field use shown in table 11 in this chapter. Residue gas which remains after the natural gas liquids have been extracted in 1963 totaled 11,760 billion cubic feet (83 percent of which was marketed, 13 percent was returned to the well for repressuring, and 4 percent was used as fuel at the processing plant).

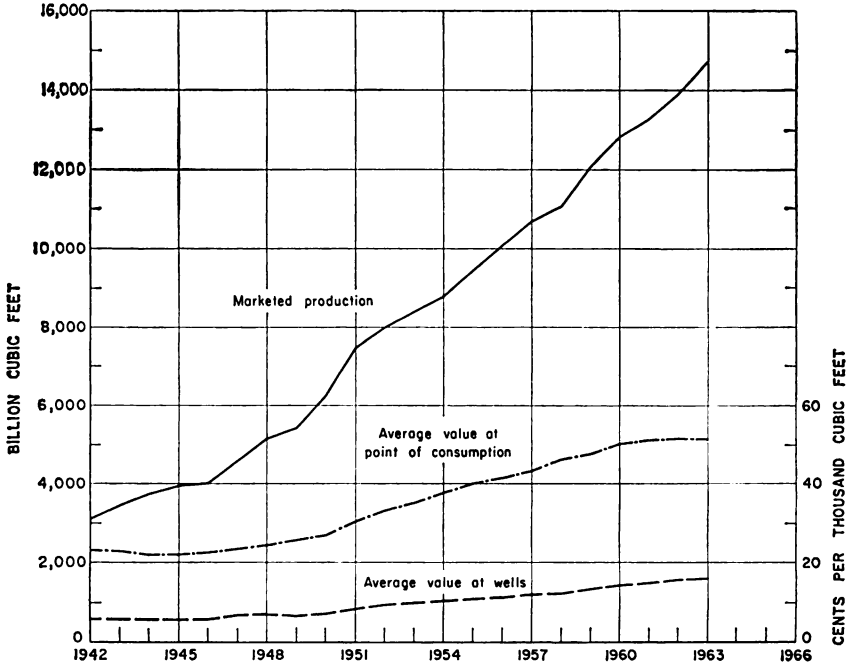

FIGURE 1.—Production and average value of natural gas in the United States, 1942–63.

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TABLE 8.—Marketed production, interstate shipments, and total consumption of natural gas in the United States,[1] in 1963

(Million cubic feet)

State by region or country	Marketed production		Interstate movements		Transmission loss and unaccounted for	Change in underground storage	Consumption
	Quantity	Average value at wellhead (cents per Mcf)	Quantity shipped	Quantity received			
New England:							
Connecticut				35,773	964		34,809
Massachusetts				98,735	288		98,447
New Hampshire				3,992	396		3,596
Rhode Island				15,393	668		14,725
Total:							
1963				153,893	2,316		151,577
1962				143,087	4,736		138,351
Middle Atlantic:							
New Jersey				199,465	11,216		188,249
New York	3,962	29.5	3,657	521,760	14,197	926	506,942
Pennsylvania	92,657	26.0	114,956	631,925	23,577	623	585,426
Total:							
1963	96,619	26.1	118,613	1,353,150	48,990	1,549	1,280,617
1962	94,315	27.2	90,178	1,233,376	43,874	−5,035	1,198,674
East North Central:							
Illinois	9,459	12.9	427	688,128	25,852	12,876	658,432
Indiana	286	23.4	123	317,745	10,336	9,675	297,897
Michigan	32,850	27.1		471,030	15,856	24,357	463,667
Ohio	36,817	24.2	832	787,045	13,984	11,728	797,318
Wisconsin				159,357	7,003		152,354
Total:							
1963	79,412	24.0	1,382	2,423,305	73,031	58,636	2,369,668
1962	76,668	22.4	1,830	2,222,623	50,196	18,056	2,229,209
West North Central:							
Iowa				231,557	4,154	8,398	219,005
Kansas	732,946	13.3	665,203	340,462	19,887	438	387,880
Minnesota				221,717	2,670		219,047
Missouri	100	27.0	42	311,053	5,122	2,914	303,075
Nebraska	13,051	18.8		136,855	1,151	−259	149,014
North Dakota	32,798	19.1	11,025	2,358	366		23,765
South Dakota				25,407	248		25,159
Total:							
1963	778,895	13.6	676,270	1,269,409	33,598	11,491	1,326,945
1962	734,479	12.6	588,172	1,182,363	15,168	20,631	1,292,871
South Atlantic:							
Delaware				16,744	294	72	16,378
District of Columbia				20,047	688		19,359
Florida	35	20.0		180,892	3,431		177,496
Georgia				192,353	4,753		187,600
Maryland	1,633	26.9	413	83,307	2,753		81,774
North Carolina				65,328	3,032		62,296
South Carolina				78,417	3,318		75,099
Virginia	2,085	23.4	1,760	86,064	3,394	−16	83,011
West Virginia	210,223	26.6	230,514	227,453	2,926	13,972	190,264
Total:							
1963	213,976	26.6	232,687	950,605	24,589	14,028	893,277
1962	215,698	27.4	206,158	857,389	18,606	−5,305	853,628
East South Central:							
Alabama	177	11.9	9	208,279	2,684		205,763
Kentucky	74,634	23.9	55,008	160,775	4,610	−137	175,928
Mississippi	176,807	18.0	145,728	199,861	3,656	100	227,184
Tennessee	90	18.9		170,803	1,475		169,418
Total:							
1963	251,708	19.7	200,745	739,718	12,425	−37	778,293
1962	240,715	20.7	197,272	696,671	10,740	−603	729,977

See footnote at end of table.

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TABLE 8.—Marketed production, interstate shipments, and total consumption of natural gas in the United States,[1] in 1963—Continued

State by region or country	Marketed production		Interstate movements		Transmission loss and unaccounted for	Change in underground storage	Consumption
	Quantity	Average value at wellhead (cents per Mcf)	Quantity shipped	Quantity received			
West South Central:							
Arkansas	76,101	15.5	4,189	195,350	15,442	691	251,129
Louisiana	3,928,427	19.8	3,051,589	213,625	19,992	----------	1,070,471
Oklahoma	1,233,883	13.0	653,142	32,635	20,763	4,368	588,245
Texas	6,205,034	12.5	2,948,716	102,501	43,913	1,069	3,313,837
Total:							
1963	11,443,445	15.1	6,657,636	544,111	100,110	6,128	5,223,682
1962	10,732,596	14.8	6,140,368	434,496	82,108	17,137	4,927,479
Mountain:							
Arizona	1,334	12.1	810	159,051	2,081	----------	157,494
Colorado	105,705	11.7	47,040	156,259	5,892	1,369	207,663
Idaho	----------	----------	----------	26,008	−627	----------	26,635
Montana	30,026	7.5	1,556	52,822	1,020	12,935	67,337
Nevada	----------	----------	----------	19,275	−17	----------	19,292
New Mexico	808,377	11.9	570,697	58,243	21,894	−1,940	275,969
Utah	77,122	18.2	30,942	62,489	4,845	196	103,628
Wyoming	209,060	14.2	144,743	5,828	637	−371	69,879
Total:							
1963	1,231,624	12.6	795,788	539,975	35,725	12,189	927,897
1962	1,215,747	12.3	792,758	528,723	19,487	10,040	922,185
Pacific:							
Alaska	4,498	24.7	----------	----------	284	----------	4,214
California	646,486	29.3	----------	964,644	30,216	26,788	1,554,126
Oregon	----------	----------	----------	45,313	1,963	----------	43,350
Washington	----------	----------	----------	88,245	1,411	----------	86,834
Total:							
1963	650,984	29.3	----------	1,098,202	33,874	26,788	1,688,524
1962	566,404	29.0	----------	1,103,728	40,811	31,566	1,597,755
Total United States:							
1963	14,746,663	15.8	8,683,121	9,072,368	364,658	130,772	14,640,480
1962	13,876,622	15.5	8,016,736	8,402,456	285,726	86,487	13,890,129
Foreign:							
Canada	----------	----------	356,455	6,879	----------	----------	----------
Mexico	----------	----------	49,749	10,078	----------	----------	----------
Total Foreign	----------	----------	406,204	16,957	----------	----------	----------
Total movements	----------	----------	9,089,325	9,089,325	----------	----------	----------

[1] No shipments were made into Maine, Vermont, and Hawaii.

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TABLE 9.—Natural gas moving interstate, imports, and exports, 1963

(Million cubic feet)

State by region or country	Quantity received	Producing region								
		Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Canada	Mexico
New England:										
Connecticut	35,773	2,144	34	--------	1	770	31,993	--------	--------	831
Massachusetts	98,735	5,369	85	2	5	1,926	89,266	--------	--------	2,082
New Hampshire	3,992	3	-------	--------	--------	2	3,987	--------	--------	------
Rhode Island	15,393	1,171	18	--------	--------	420	13,331	--------	--------	453
Total	153,893	8,687	137	2	6	3,118	138,577	--------	--------	3,366
Middle Atlantic:										
New Jersey	199,465	7,335	12	5	130	2,569	186,641	--------	--------	2,773
New York	521,760	81,406	169	2	8,972	4,756	421,937	--------	--------	4,518
Pennsylvania	631,925	4,603	568	19	60,521	16,482	536,476	--------	--------	13,256
Total	1,353,150	93,344	749	26	69,623	23,807	1,145,054	--------	--------	20,547
East North Central:										
Illinois	688,128	--------	123	40,263	--------	133	646,320	585	277	427
Indiana	317,745	--------	10	33,050	--------	710	283,310	21	--------	644
Michigan	471,030	--------	-------	49,937	--------	535	420,105	133	172	148
Ohio	787,045	14,691	215	33,023	103,647	31,421	593,255	21	--------	10,772
Wisconsin	159,357	--------	-------	18,142	--------	--------	82,228	951	58,036	------
Total	2,423,305	14,691	348	174,415	103,647	32,799	2,025,218	1,711	58,485	11,991
West North Central:										
Iowa	231,557	--------	-------	98,805	--------	--------	127,851	4,901	--------	------
Kansas	340,462	--------	-------	2,332	--------	--------	325,083	13,047	--------	------
Minnesota	221,717	--------	-------	129,339	--------	--------	83,299	6,675	2,404	------
Missouri	311,053	--------	-------	103,467	--------	167	206,447	97	--------	875
Nebraska	136,855	--------	-------	83,541	--------	--------	38,974	14,340	--------	------
North Dakota	2,358	--------	-------	146	--------	--------	--------	316	1,896	------
South Dakota	25,407	--------	-------	13,847	--------	--------	6,338	5,222	--------	------
Total	1,269,409	--------	-------	431,477	--------	167	787,992	44,598	4,300	875
South Atlantic:										
Delaware	16,744	16	-------	--------	--------	7	16,714	--------	--------	7
District of Columbia	20,047	207	-------	--------	6,303	1,123	12,409	--------	--------	5
Florida	180,892	--------	-------	--------	--------	10,852	169,962	--------	--------	78
Georgia	192,353	--------	-------	--------	--------	44,627	147,697	--------	--------	29
Maryland	83,307	363	-------	--------	24,922	4,357	53,619	--------	--------	46
North Carolina	65,328	--------	-------	--------	--------	1	65,327	--------	--------	------
South Carolina	78,417	--------	-------	--------	--------	14,020	64,389	--------	--------	8
Virginia	86,064	--------	-------	--------	24,212	4,334	57,518	--------	--------	------
West Virginia	227,453	1,302	146	--------	2,911	15,931	207,083	--------	--------	80
Total	950,605	1,888	146	--------	58,348	95,252	794,718	--------	--------	253
East South Central:										
Alabama	208,279	--------	-------	--------	--------	43,379	164,533	--------	--------	367
Kentucky	160,775	3	2	--------	1,063	545	158,213	--------	--------	949
Mississippi	199,861	--------	-------	--------	--------	342	198,751	--------	--------	768
Tennessee	170,803	--------	-------	--------	--------	278	169,720	--------	--------	805
Total	739,718	3	2	--------	1,063	44,544	691,217	-------	--------	2,889
West South Central:										
Arkansas	195,350	--------	-------	11	--------	41	194,901	1	--------	396
Louisiana	213,625	--------	-------	--------	--------	956	208,726	--------	--------	3,943
Oklahoma	32,635	--------	-------	4,009	--------	--------	28,469	157	--------	------
Texas	102,501	--------	-------	22	--------	61	86,330	10,599	--------	5,489
Total	544,111	--------	-------	4,042	--------	1,058	518,426	10,757	--------	9,828

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TABLE 9.—Natural gas moving interstate, imports, and exports, 1963—Continued

(Million cubic feet)

State by region or country	Quantity received	Producing region								
		Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Canada	Mexico
Mountain:										
Arizona	159,051			17			64,730	94,304		
Colorado	156,259			55,687			61,884	38,688		
Idaho	26,008							18,508	7,500	
Montana	52,822			7,071				18,775	26,976	
Nevada	19,275						6,310	12,488	477	
New Mexico	58,243			2			50,083	8,158		
Utah	62,489							62,489		
Wyoming	5,828			1,564			1,771	2,493		
Total	539,975			64,341			184,778	255,903	34,953	
Pacific:										
California	964,644			47			358,580	479,001	127,016	
Oregon	45,313							1,857	43,456	
Washington	88,245								88,245	
Total	1,098,202			47			358,580	480,858	258,717	
Total United States	9,072,368	118,613	1,382	674,350	232,687	200,745	6,644,560	793,827	356,455	49,749
Foreign:										
Canada	6,879			1,920			4,854	105		
Mexico	10,078						8,222	1,856		
Total exports	16,957			1,920			13,076	1,961		
Total	9,089,325	118,613	1,382	676,270	232,687	200,745	6,657,636	795,788	356,455	49,749

Consumption

The total consumption of natural gas for domestic uses totaled 14,640 billion cubic feet in 1963, an increase of 5 percent for the year.

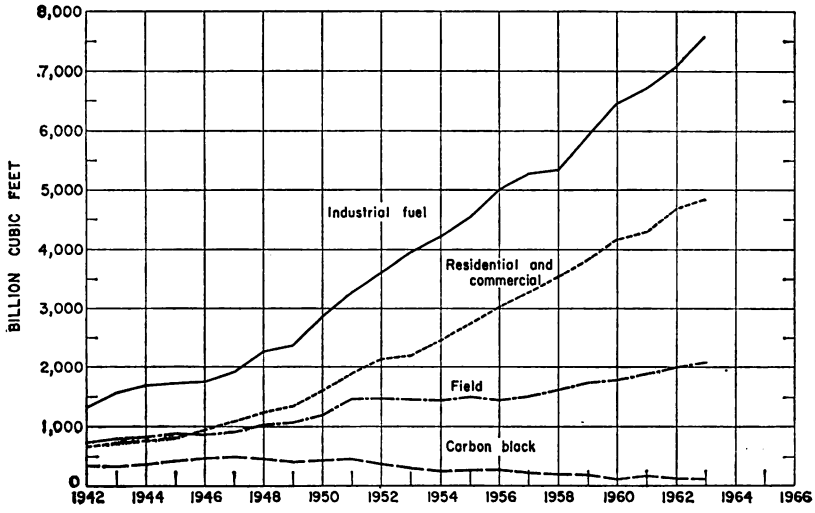

FIGURE 2.—Consumption of natural gas, by uses, in the United States, 1942–63.

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With the exception of natural gas used in the production of carbon black, which has been declining since 1959, other end-use categories increased in 1963. Consumption by class of consumer and percentage change from 1962 were as follows: Residential, 3,589 billion cubic feet (+3 percent); Commercial, 1,268 billion cubic feet (+1 percent); Industrial, excluding field and carbon black, 7,585 billion cubic feet (+7 percent). The portland cement industry consumed 198 billion cubic feet in 1963 compared to 188 billion last year. Residential consumers totaled 33,451,000 in 1963, an increase of 110,000 for the year.

TABLE 10.—Consumption of natural gas in the United States[1]

State by Region	Quantity (million cubic feet)					Change from 1962 (percent)	Estimated value at points of consumption (thousand dollars)	
	1959	1960	1961	1962	1963		1962	1963
New England:								
Connecticut	25,875	28,453	30,361	32,227	34,809	8.0	53,864	55,209
Massachusetts	72,994	77,886	81,768	89,015	98,447	10.6	150,948	145,529
New Hampshire	2,480	2,852	3,018	3,315	3,596	8.5	5,582	5,949
Rhode Island	11,011	11,839	12,780	13,794	14,725	6.7	22,228	22,723
Total	112,360	121,030	127,927	138,351	151,577	9.6	232,622	229,410
Middle Atlantic:								
New Jersey	132,984	139,258	153,806	174,210	188,249	8.1	249,726	258,879
New York	379,928	419,460	435,417	474,384	506,942	6.9	547,904	559,543
Pennsylvania	502,066	520,788	529,716	550,080	585,426	6.4	452,810	467,638
Total	1,014,978	1,079,506	1,118,939	1,198,674	1,280,617	6.8	1,250,440	1,286,060
East North Central:								
Illinois	518,111	536,549	574,346	620,309	658,432	6.1	489,550	509,572
Indiana	171,158	212,851	239,932	272,309	297,897	9.4	175,926	192,725
Michigan	332,756	368,531	407,732	443,677	463,667	4.5	365,979	381,533
Ohio	670,618	698,569	719,674	756,398	797,318	5.4	535,155	568,000
Wisconsin	82,377	90,620	113,679	136,516	152,354	11.6	124,976	136,589
Total	1,775,020	1,907,120	2,055,363	2,229,209	2,369,668	6.3	1,691,586	1,788,419
West North Central:								
Iowa	182,827	187,138	204,663	213,552	219,005	2.6	121,576	124,253
Kansas	380,241	372,302	364,957	380,055	387,880	2.1	117,864	119,191
Minnesota	161,390	179,827	192,584	214,130	219,047	2.3	135,955	137,400
Missouri	255,095	261,372	274,487	289,482	303,075	4.7	160,690	169,147
Nebraska	132,651	139,028	143,169	146,043	149,014	2.0	71,061	69,135
North Dakota	16,981	17,274	19,625	22,196	23,765	7.1	8,501	9,662
South Dakota	23,584	24,533	25,820	27,413	25,159	−8.2	16,242	15,518
Total	1,152,769	1,181,474	1,225,305	1,292,871	1,326,945	2.6	631,889	644,306
South Atlantic:								
Delaware	9,459	9,035	9,380	14,492	16,378	13.0	11,978	14,971
District of Columbia	17,123	18,142	18,518	19,338	19,359	0.1	28,691	28,731
Florida	91,490	137,875	143,656	157,735	177,496	12.5	82,587	90,122
Georgia	180,342	182,087	179,957	192,638	187,600	−2.6	116,375	120,080
Maryland	60,674	64,923	68,390	76,551	81,774	6.8	100,298	106,554
North Carolina	32,685	45,442	50,523	56,373	62,296	10.5	42,712	46,415
South Carolina	54,363	58,532	60,928	70,645	75,099	6.3	43,082	45,184
Virginia	59,842	66,181	70,579	77,254	83,011	7.5	79,311	85,575
West Virginia	191,548	179,969	192,221	188,602	190,264	0.9	101,067	103,684
Total	697,526	702,186	794,152	853,628	893,277	4.6	606,101	641,316

See footnote at end of table.

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TABLE 10.—Consumption of natural gas in the United States[1]—Continued

State by Region	Quantity (million cubic feet)					Change from 1962 (percent)	Estimated value at points of consumption (thousand dollars)	
	1959	1960	1961	1962	1963		1962	1963
East South Central:								
Alabama	178,595	184,118	184,909	194,369	205,763	5.9	102,247	112,688
Kentucky	147,993	159,710	161,912	168,138	175,928	4.6	94,807	97,858
Mississippi	183,158	188,864	190,930	199,733	227,184	13.7	71,702	76,305
Tennessee	149,462	155,623	160,667	167,737	169,418	1.0	81,224	89,045
Total	659,208	688,315	698,418	729,977	778,293	6.6	349,980	375,896
West South Central:								
Arkansas	218,528	216,516	209,420	224,744	251,129	11.7	73,709	82,409
Louisiana	893,369	947,938	1,036,887	1,007,041	1,070,471	6.3	244,660	268,358
Oklahoma	379,178	383,042	378,096	485,726	588,245	21.1	129,834	151,723
Texas	2,865,595	2,981,167	3,030,914	3,209,968	3,313,837	3.2	661,296	707,973
Total	4,356,670	4,528,663	4,655,317	4,927,479	5,223,682	6.0	1,109,499	1,210,463
Mountain:								
Arizona	112,722	135,494	153,674	157,892	157,494	−0.3	71,203	77,744
Colorado	196,057	207,646	212,611	204,940	207,663	1.3	81,665	81,611
Idaho	19,641	22,006	23,969	25,806	26,635	3.2	15,074	15,868
Montana	52,183	54,569	57,781	63,298	67,337	6.4	26,524	27,786
Nevada	10,450	12,447	15,864	17,528	19,292	10.1	12,172	14,279
New Mexico	272,922	266,409	288,455	292,495	275,969	−5.7	61,382	66,645
Utah	61,401	75,650	81,879	92,890	103,628	11.6	42,437	44,716
Wyoming	59,119	59,635	61,451	67,336	69,879	3.8	15,821	15,994
Total	784,495	833,856	895,684	922,185	927,897	0.6	326,278	344,643
Pacific:								
Alaska	133	229	557	2,137	4,214	97.2	1,640	3,128
California	1,180,331	1,311,253	1,405,882	1,476,322	1,554,126	5.3	868,855	887,674
Oregon	27,498	30,861	33,827	37,865	43,350	14.5	28,165	31,912
Washington	58,650	64,934	70,343	81,431	86,834	6.6	47,635	53,769
Total	1,266,612	1,407,277	1,510,609	1,597,755	1,688,524	5.7	946,295	976,483
Total United States	11,819,638	12,509,427	13,081,714	13,890,129	14,640,480	5.4	7,144,690	7,496,996

[1] Includes volume of natural gas which is distributed as a component of mixed gas.

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TABLE 11.—Number of consumers and volume of natural gas consumed by principal uses in the United States, in 1963 [1]

State by region	Number of consumers (in thousands)		Volume of natural gas, million cubic feet									
					Industrial						Total consumption	Consumed at electric utilities (included in other industrial fuel)[2]
	Residential	Commercial	Residential	Commercial	Field (pumping, drilling, extraction loss, plant fuel)	Carbon black	Petroleum refineries	Used as pipeline fuel	All other fuel including electric utilities	Total industrial		
New England:												
Connecticut	351	24	19,641	5,501	----------	----------	----------	150	9,517	9,667	34,809	337
Massachusetts	951	60	58,235	14,632	----------	----------	----------	242	25,338	25,580	98,447	11,177
New Hampshire	28	2	2,276	704	----------	----------	----------	----------	616	616	3,596	----------
Rhode Island	146	7	8,216	2,345	----------	----------	----------	144	4,020	4,164	14,725	294
Total	1,476	93	88,368	23,182	----------	----------	----------	536	39,491	40,027	151,577	11,808
Middle Atlantic:												
New Jersey	1,488	105	102,657	15,802	----------	----------	----------	558	69,232	69,790	188,249	28,797
New York	3,744	285	264,246	81,419	555	----------	----------	2,923	157,799	161,277	506,942	81,920
Pennsylvania	2,040	128	250,241	64,034	2,164	----------	27,512	16,849	224,626	271,151	585,426	4,109
Total	7,272	518	617,144	161,255	2,719	----------	27,512	20,330	451,657	502,218	1,280,617	114,826
East North Central:												
Illinois	2,369	153	289,550	74,887	17,968	----------	13,051	11,721	251,255	293,995	658,432	46,624
Indiana	813	74	98,957	32,456	82	----------	11,716	7,488	147,198	166,464	297,897	16,639
Michigan	1,529	127	242,886	68,676	2,200	----------	1,819	2,658	145,428	152,105	463,667	1,988
Ohio	2,188	175	402,736	130,777	1,633	----------	10,134	10,381	241,657	263,805	797,318	2,155
Wisconsin	588	41	63,777	16,787	----------	----------	2,965	411	68,414	71,790	152,354	12,467
Total	7,487	570	1,097,906	323,583	21,883	----------	39,685	32,659	853,952	948,179	2,369,668	79,873
West North Central:												
Iowa	459	50	68,074	33,212	----------	----------	----------	9,516	108,203	117,719	219,005	52,957
Kansas	527	51	82,039	26,600	28,338	----------	29,523	46,819	174,561	279,241	387,880	106,157
Minnesota	491	38	71,064	41,757	----------	----------	(3)	766	[3] 105,460	106,226	219,047	55,784
Missouri	834	69	120,408	40,087	----------	----------	(3)	7,863	[3] 134,717	142,580	303,075	41,386
Nebraska	278	36	40,706	22,429	4,600	----------	(3)	6,529	[3] 74,750	85,879	149,014	36,693
North Dakota	39	5	4,859	4,585	12,676	----------	(3)	5	[3] 1,640	14,321	23,765	50
South Dakota	64	8	8,389	7,348	----------	----------	----------	38	9,384	9,422	25,159	4,320
Total	2,692	257	395,539	176,018	45,614	----------	[3] 33,691	71,536	[3] 604,547	755,388	1,326,945	297,347

See footnotes at end of table.

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TABLE 11.—Number of consumers and volume of natural gas consumed by principal uses in the United States, in 1963[1]—Continued

State by region	Number of consumers (in thousands)		Volume of natural gas, million cubic feet									
					Industrial						Total consumption	Consumed at electric utilities (included in other industrial fuel)[2]
	Residential	Commercial	Residential	Commercial	Field (pumping, drilling, extraction loss, plant fuel)	Carbon black	Petroleum refineries	Used as pipeline fuel	All other fuel including electric utilities	Total industrial		
South Atlantic:												
Delaware	66	4	5,019	994			(3)		[3] 10,365	10,365	16,378	3,369
District of Columbia	(4)	(4)	(4)	(4)					(4)	(4)	(4)	
Florida	314	21	7,286	13,428	2,856			2,385	151,541	156,782	177,496	95,543
Georgia	602	52	63,459	26,051			(3)	4,549	[3] 93,541	98,090	187,600	2,871
Maryland	[4] 722	[4] 57	[4] 62,655	[4] 15,199	2			1,126	[4] 22,151	[4] 23,279	[4] 101,133	88
North Carolina	158	23	13,810	5,950				3,832	38,704	42,536	62,296	2,823
South Carolina	149	18	10,242	6,477				1,962	56,418	58,380	75,099	22,066
Virginia	381	33	33,236	13,391	8			5,987	30,389	36,384	83,071	1,731
West Virginia	331	30	52,209	17,081	38,158		625	9,099	73,092	120,974	190,264	632
Total	2,723	238	247,916	98,571	41,024		[3] 1,844	28,940	[3] 474,982	546,790	893,277	129,123
East South Central:												
Alabama	548	42	47,644	33,123	169		(3)	10,478	[3] 114,349	124,996	205,763	5,522
Kentucky	436	44	64,679	25,369	12,150		(3)	23,620	[3] 50,110	85,880	175,928	1,291
Mississippi	273	36	24,824	19,920	19,657		(3)	38,179	[3] 124,604	182,440	227,184	47,282
Tennessee	371	45	40,524	27,115			(3)	18,333	[3] 83,446	101,779	169,418	4,572
Total	1,628	167	177,671	105,527	31,976		[3] 6,333	90,610	[3] 366,176	495,095	778,293	58,667
West South Central:												
Arkansas	333	49	37,342	22,670	10,983		11,376	9,610	159,148	191,117	251,129	57,161
Louisiana	730	59	62,628	22,407	222,266	21,924	104,533	38,681	598,032	985,436	1,070,471	146,797
Oklahoma	573	59	62,637	26,704	190,300		47,155	8,878	252,571	498,904	588,245	116,458
Texas	2,241	227	198,263	74,975	1,175,807	76,750	427,025	65,583	1,295,434	3,040,599	3,313,837	553,978
Total	3,877	394	360,870	146,756	1,599,356	98,674	590,089	122,752	2,305,185	4,716,056	5,223,682	874,394
Mountain:												
Arizona	337	33	23,334	13,285	124			14,485	106,266	120,875	157,494	55,453
Colorado	406	53	55,430	31,649	12,324		2,499	1,667	104,094	120,584	207,663	33,823
Idaho	37	7	3,612	3,887				221	18,915	19,136	26,635	
Montana	118	14	17,369	12,638	8,066		3,566	1,213	24,485	37,330	67,337	3,303
Nevada	32	1	2,648	1,444					15,200	15,200	19,292	9,619
New Mexico	168	27	24,528	10,016	[5] 126,664	(5)	1,314	23,232	90,215	241,425	275,969	38,800

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Utah	195	25	29,147	13,101	10,475	----------	6,366	256	44,283	61,380	103,628	5,102
Wyoming	64	9	8,987	7,271	29,884	----------	10,055	1,706	11,976	53,621	69,879	241
Total	1,357	169	165,055	93,291	[5] 187,537	([6])	23,800	42,780	415,434	669,551	927,897	146,341
Pacific:												
Alaska	4	1	685	1,614	754	----------	----------	42	1,119	1,915	4,214	([6])
California	4,688	341	416,210	125,467	[5] 169,180	([6])	66,997	13,562	762,710	1,012,449	1,554,126	429,972
Oregon	113	16	9,084	4,179	----------	----------	----------	36	30,051	30,087	43,350	579
Washington	134	24	12,573	8,340	----------	----------	----------	----------	65,921	65,921	86,834	----------
Total	4,939	382	438,552	139,600	[5] 169,934	([6])	66,997	13,640	859,801	1,110,372	1,688,524	430,551
Total United States:												
1963	33,451	2,788	3,589,021	1,267,783	[5] 2,081,339	[5] 117,378	[3] 789,951	423,783	[3] 6,371,225	9,783,676	14,640,480	2,142,930
1962	32,655	2,712	3,478,563	1,206,668	1,993,128	133,302	789,877	382,496	5,906,095	9,204,898	13,890,129	1,965,590

[1] Includes natural gas which is distributed as component of mixed gas.
[2] Source: Federal Power Commission. Preliminary.
[3] 11,720 million cubic feet included in "Other industrial fuel" to avoid disclosure; included in "Refinery Fuel" region totals.
[4] Included with Maryland to avoid disclosure.
[5] 18,704 million cubic feet included in "Field" to avoid disclosure; included in U.S. carbon black total.
[6] Not available. Included in "Other industrial fuel."

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TABLE 12.—Value of natural gas at the point of consumption in the United States, in 1963

State by region	Value (thousand dollars)							Average value (cent per Mcf)						
			Industrial							Industrial				
	Residential	Commercial	Field (pumping, drilling, extraction loss and plant fuel)	Carbon black	All other including electric utilities	Total industrial	Total consumption	Residential	Commercial	Field	Carbon black	All other	Total	Total consumption
New England:														
Connecticut	37,719	8,557			8,933	8,933	55,209	192.0	155.6			92.4	92.4	158.6
Massachusetts	104,928	23,373			17,228	17,228	145,529	180.2	156.7			67.3	67.3	147.8
New Hampshire	4,229	1,192			528	528	5,949	185.8	169.3			85.7	85.7	165.4
Rhode Island	16,075	3,451			3,197	3,197	22,723	195.7	147.2			76.8	76.8	154.3
Total	162,951	36,573			29,886	29,886	229,410	184.4	157.8			74.7	74.7	151.3
Middle Atlantic:														
New Jersey	196,180	25,486			37,213	37,213	258,879	191.1	161.3			53.3	53.3	137.5
New York	354,052	108,014	339		97,138	97,477	559,543	134.0	132.7	61.0		60.4	60.4	110.4
Pennsylvania	275,214	56,733	826		134,865	135,691	467,638	110.0	88.6	38.2		50.1	50.0	79.9
Total	825,446	190,233	1,165		269,216	270,381	1,286,060	133.8	118.0	42.8		53.9	53.8	100.4
East North Central:														
Illinois	326,618	65,057	2,287		115,610	117,897	509,572	112.8	86.9	12.7		41.9	40.1	77.4
Indiana	98,099	29,607	14		65,005	65,019	192,725	99.1	91.2	17.1		39.1	39.1	64.7
Michigan	241,446	59,346	598		80,143	80,741	381,533	99.4	86.4	27.2		53.5	53.1	82.3
Ohio	329,699	97,043	694		140,564	141,258	568,000	81.9	74.2	42.5		53.6	53.5	71.2
Wisconsin	77,833	17,174			41,582	41,582	136,589	122.0	102.3			57.9	57.9	89.7
Total	1,073,695	268,227	3,593		442,904	446,497	1,788,419	97.8	82.9	16.4		47.8	47.1	75.5
West North Central:														
Iowa	64,902	22,448			36,903	36,903	124,253	95.3	67.6			31.3	31.3	56.7
Kansas	46,130	12,097	4,096		56,868	60,964	119,191	56.2	45.5	14.5		22.7	21.8	30.7
Minnesota	79,014	25,499			32,887	32,887	137,400	111.2	61.1			31.0	31.0	62.7
Missouri	99,239	26,200			43,708	43,708	169,147	82.4	65.4			30.7	30.7	55.8
Nebraska	33,207	13,134	453		22,341	22,794	69,135	81.6	58.6	9.8		27.5	26.6	46.4
North Dakota	4,317	2,685	2,041		619	2,660	9,662	88.8	58.6	16.1		37.6	18.6	40.7
South Dakota	8,192	4,414			2,912	2,912	15,518	97.7	60.1			30.9	30.9	61.7
Total	335,001	106,477	6,590		196,238	202,828	644,306	84.7	60.5	14.4		27.6	26.9	48.6

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South Atlantic:														
Delaware	8,533	1,435			5,003	5,003	14,971	170.0	144.4			48.3	48.3	91.4
District of Columbia	(1)	(1)			(1)	(1)	(1)	(1)	(1)			(1)	(1)	(1)
Florida	20,583	16,446	540		52,553	53,093	90,122	282.5	122.5	18.9		34.1	33.9	50.8
Georgia	65,969	18,446			35,665	35,665	120,080	104.0	70.8			36.4	36.4	64.0
Maryland	[1] 96,572	[1] 20,638	1		[1] 18,074	[1] 18,075	[1] 135,285	[1] 154.1	[1] 135.8	50.0		[1] 77.6	[1] 77.6	[1] 133.8
North Carolina	19,808	7,451			19,156	19,156	46,415	143.4	125.2			45.0	45.0	74.5
South Carolina	14,790	6,426			23,968	22,968	45,184	144.4	99.2			41.1	41.1	60.2
Virginia	53,098	15,249	3		17,225	17,228	85,575	159.8	113.9	37.5		47.4	47.4	103.1
West Virginia	44,030	11,938	10,181		37,535	47,716	103,684	84.3	69.9	26.7		45.3	39.4	54.5
Total	323,383	98,029	10,725		209,179	219,904	641,316	130.4	99.5	26.1		41.4	40.2	71.8
East South Central:														
Alabama	55,100	18,852	66		38,670	38,736	112,688	115.6	56.9	39.1		31.0	31.0	54.8
Kentucky	52,533	17,012	1,787		26,526	28,313	97,858	81.2	67.1	14.7		36.0	33.0	55.6
Mississippi	22,077	9,724	3,475		41,029	44,504	76,305	88.9	48.8	17.7		25.2	24.4	33.6
Tennessee	39,255	18,210			31,580	31,580	89,045	96.9	67.2			31.0	31.0	52.6
Total	168,965	63,798	5,328		137,805	143,133	375,896	95.1	60.5	16.7		29.8	28.9	48.3
West South Central:														
Arkansas	26,884	10,914	2,091		42,520	44,611	82,409	72.0	48.1	19.4		23.6	23.3	32.8
Louisiana	44,322	10,136	34,267	3,310	176,323	213,900	268,358	70.8	45.2	15.4	15.1	23.8	21.7	25.1
Oklahoma	45,718	13,159	24,929		67,917	92,846	151,723	73.0	49.3	13.1		22.0	18.6	25.8
Texas	168,913	43,245	136,231	8,925	350,659	495,815	707,973	85.2	57.7	11.6	11.6	19.6	16.3	21.4
Total	285,837	77,454	197,518	12,235	637,419	847,172	1,210,463	79.2	52.8	12.3	12.4	21.1	18.0	23.2
Mountain:														
Arizona	22,298	7,376	16		48,054	48,070	77,744	95.6	55.5	12.9		39.8	39.8	49.4
Colorado	37,682	17,283	1,300		25,346	26,646	81,611	68.0	54.6	10.5		23.4	22.1	39.3
Idaho	4,751	3,491			7,626	7,626	15,868	131.5	89.8			39.9	39.9	59.6
Montana	12,961	6,411	559		7,855	8,414	27,786	74.6	50.7	6.9		26.8	22.5	41.3
Nevada	3,476	1,303			9,500	9,500	14,279	131.3	90.2			62.5	62.5	74.0
New Mexico	19,641	6,429	[2] 14,037	(2)	26,538	40,575	66,645	80.1	64.2	[2] 11.1	(2)	23.1	16.8	24.1
Utah	21,388	7,053	1,623		14,652	16,275	44,716	73.4	53.8	15.5		28.8	26.5	43.2
Wyoming	5,832	3,128	2,610		4,424	7,034	15,994	64.9	43.0	8.7		18.6	13.1	22.9
Total	128,029	52,474	[2] 20,145	(2)	143,995	164,140	344,643	77.6	56.2	[2] 10.7	(2)	29.9	24.5	37.1
Pacific:														
Alaska	869	1,467	189		603	792	3,128	126.9	90.9	25.1		51.9	41.4	74.2
California	413,459	86,325	[2] 52,079	(2)	335,811	387,890	887,674	99.3	68.8	[2] 30.8	(2)	39.8	38.3	57.1
Oregon	13,762	6,014			12,136	12,136	31,912	151.5	143.9			40.3	40.3	73.6
Washington	18,484	8,841			26,444	26,444	53,769	147.0	106.0			40.1	40.1	61.9
Total	446,574	102,647	[2] 52,268	(2)	374,994	427,262	976,483	101.8	73.5	[2] 30.8	(2)	39.9	38.5	57.8
Total United States:														
1963	3,749,881	995,912	[2] 294,655	[2] 14,912	2,441,636	2,751,203	7,496,996	104.5	78.6	[2] 14.2	[2] 12.7	32.2	28.1	51.2
1962	3,629,478	940,185	281,523	15,001	2,278,503	2,575,027	7,144,690	104.3	77.9	14.1	11.3	32.2	28.0	51.4

[1] Included with Maryland to avoid disclosure.
[2] 2,677 thousand dollars in value included in "Field" to avoid disclosure; included in "Carbon black" United States total.

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TABLE 13.—Natural gas processed at natural gas processing plants in the United States

(Million cubic feet)

States	1959	1960	1961	1962	1963
Arkansas	73,503	120,943	112,490	121,911	132,535
California	527,297	548,406	553,734	539,594	549,077
Colorado	[1] 101,253	84,322	96,177	83,643	121,043
Illinois	[2] 197,246	[2] 194,679	[2] 198,964	[2] 197,180	[2] 199,877
Kansas	432,068	451,676	508,213	592,035	687,331
Kentucky	[3] 375,591	[3 4] 273,558	[3 4] 295,314	[3 4] 329,137	[3 4] 298,450
Louisiana	1,047,481	1,491,078	1,694,071	2,015,188	2,646,572
Michigan	[2]	[4]	[4]	[4]	[4]
Mississippi	180,583	131,369	108,156	95,486	90,459
Montana	[1]	[5] 41,480	[5] 55,850	[5] 53,890	[5] 50,986
Nebraska	[6] 37,680	[6] 41,663	[6] 40,388	[6] 34,837	10,667
New Mexico	652,976	662,479	665,602	732,421	696,880
North Dakota	[6]	[6]	[6]	[6]	32,854
Oklahoma	708,616	760,743	798,653	880,422	878,755
Pennsylvania	2,932	2,639	2,612	2,555	3,127
Texas	4,508,288	4,578,623	4,771,916	4,997,825	5,665,071
Utah	[1]	[5]	[5]	[5]	[5]
West Virginia	215,979	214,372	209,753	[7] 241,136	[7] 209,324
Wyoming	125,369	170,159	149,776	171,981	157,345
Total	9,186,862	9,768,189	10,261,669	11,089,241	12,430,353

[1] Montana and Utah included in Colorado.
[2] Michigan and Ohio included in Illinois.
[3] Includes gas from transmission lines; previously treated in other States.
[4] Michigan included in Kentucky.
[5] Utah included in Montana.
[6] North Dakota included in Nebraska.
[7] Florida included in West Virginia.

TABLE 14.—Consumption of natural gas used with manufactured gas in the United States [1]

State	Residential		Commercial		Industrial	Total	
	Number of consumers (thousands)	Quantity (million cubic feet)	Number of consumers (thousands)	Quantity (million cubic feet)	Quantity (million cubic feet)	Quantity (million cubic feet)	Value at point of consumption (thousand dollars)
Connecticut	20	1,229	1	260	249	1,738	3,398
Indiana	164	14,210	10	2,150	5,550	21,910	21,954
New Jersey	209	10,545	15	1,374	5,628	17,546	25,248
New York	406	64,312	23	11,944	23,003	99,259	74,369
Pennsylvania	766	59,800	33	6,007	52,558	118,365	110,508
Total:							
1963	1,565	150,096	82	21,735	86,987	258,818	235,477
1962	1,734	151,465	120	22,604	79,524	253,593	263,114

[1] Included in tables for consumption of natural gas (tables 10–12).

VALUE AND PRICE

The average value of natural gas at the wellhead in 1963 increased 0.3 cent per thousand cubic feet to 15.8 cents. Conversely, the average value at the point of consumption decreased 0.2 cent per thousand cubic feet to 15.2 cents. The estimated total value of natural-gas marketed production in 1963 was $2,328,030,000 and the total value at point of consumption was $7,496,996,000.

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TABLE 15.—Average value of natural gas in the United States

(Cents per thousand cubic feet)

State	At wells (estimated)		At point of consumption		State	At wells (estimated)		At point of consumption	
	1962	1963	1962	1963		1962	1963	1962	1963
Alabama	9.8	11.8	52.6	54.8	Nebraska	18.2	18.8	48.7	46.4
Alaska	21.4	24.7	76.7	74.2	Nevada	------	------	69.4	74.0
Arizona	11.9	12.1	45.1	49.4	New Hampshire	------	------	168.4	165.4
Arkansas	14.9	15.5	32.8	32.8	New Jersey	------	------	143.3	137.5
California	29.0	29.3	58.9	57.1	New Mexico	11.5	11.9	21.0	24.1
Colorado	11.6	11.7	39.8	39.3	New York	28.1	29.5	115.5	110.4
Connecticut	------	------	167.1	158.6	North Carolina	------	------	75.8	74.5
Delaware	------	------	82.7	91.4	North Dakota	13.7	19.1	38.3	40.7
District of Columbia	------	------	148.4	148.4	Ohio	25.6	24.2	70.8	71.2
Florida	20.7	20.0	52.4	50.8	Oklahoma	12.8	13.0	26.7	25.8
Georgia	------	------	60.4	64.0	Oregon	------	------	74.4	73.6
Idaho	------	------	58.4	59.6	Pennsylvania	27.2	26.0	82.3	79.9
Illinois	14.3	12.9	78.9	77.4	Rhode Island	------	------	161.1	154.3
Indiana	21.1	23.4	64.6	64.7	South Carolina	------	------	61.0	60.2
Iowa	------	------	56.9	56.7	South Dakota	------	------	59.2	61.7
Kansas	12.4	13.3	31.0	30.7	Tennessee	18.5	18.9	48.4	52.6
Kentucky	24.8	23.9	56.4	55.6	Texas	12.3	12.5	20.6	21.4
Louisiana	19.7	19.8	24.3	25.1	Utah	16.8	18.2	45.7	43.2
Maryland	27.0	26.9	131.0	130.3	Virginia	27.1	23.4	102.7	103.1
Massachusetts	------	------	169.6	147.8	Washington	------	------	58.5	61.9
Michigan	21.3	27.1	82.5	82.3	West Virginia	27.5	26.6	53.6	54.5
Minnesota	------	------	63.5	62.7	Wisconsin	------	------	91.5	89.7
Mississippi	19.0	18.0	35.9	33.6	Wyoming	14.6	14.2	23.5	22.9
Missouri	25.0	27.0	55.5	55.8					
Montana	7.4	7.5	41.9	41.3	Total	15.5	15.8	51.4	51.2

WORLD PRODUCTION

The known marketed production of natural gas produced in all countries has been compiled in million cubic feet by the Bureau of Mines. The data are comparable to Bureau of Mines natural gas statistics as far as possible, that is, marketed production (see footnote 1 Table 1). However, gases used for repressuring and gases vented or flared are excluded from the data.

The proved recoverable natural gas reserves in the Dominion of Canada at the end of 1963 were estimated at 37 trillion cubic feet, of which 99 percent is located in Western Canada.

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TABLE 16.—Marketed production of natural gas by countries[1] at 60° F. (15.56° C.) and normal atmospheric pressure

(Million cubic feet)

Country [1]	1959	1960	1961	1962	1963
North America:					
Barbados	86	88	109	120	92
Canada	417,335	522,972	655,738	946,909	1,005,149
Mexico [2]	348,112	360,691	381,027	392,420	424,366
Trinidad	25,206	27,042	29,375	30,018	29,693
United States	12,046,115	12,771,038	13,254,025	13,876,622	14,746,663
South America:					
Argentina	32,119	51,607	88,673	111,852	110,313
Brazil [2]	15,994	19,962	19,663	19,082	18,806
Chile [2]	67,746	81,873	95,120	132,844	192,401
Colombia	13,345	15,077	15,674	13,771	[2] 32,270
Peru	34,171	[3]	33,710	35,151	[3]
Venezuela	177,195	190,033	200,184	214,254	230,193
Europe:					
Austria	42,098	54,830	58,073	61,013	63,406
Czechoslovakia	[4] 55,980	161,633	[3]	[3]	[3]
France	50,804	106,199	151,951	176,886	183,988
Germany, West	14,466	16,709	17,960	23,007	34,148
Hungary [2]	12,353	12,750	12,078	12,692	22,834
Italy	228,307	240,610	256,116	266,860	271,227
Netherlands	9,330	13,435	18,212	20,713	[4] 16,087
Poland	15,589	20,205	26,956	29,531	36,692
Rumania	215,797	243,304	268,603	329,805	376,970
U.S.S.R.	1,388,304	1,754,040	2,201,182	2,743,953	3,414,780
United Kingdom	35	35	106	115	[3]
Yugoslavia	1,866	1,976	2,566	3,557	3,772
Asia:					
Brunei	2,847	3,043	3,005	2,990	2,200
Burma	178	261	333	440	[3]
India	4,794	5,201	[3]	[3]	[3]
Indonesia [2]	83,224	90,725	95,577	100,988	103,222
Iran	32,055	33,558	104,221	107,161	108,511
Iraq	12,465	22,504	23,773	[3]	[3]
Israel		1,203	106	396	367
Japan [2]	18,913	27,297	35,464	45,122	63,243
Pakistan	22,365	29,842	34,665	42,076	49,459
Taiwan	983	949	1,383	1,433	1,890
Africa:					
Algeria (Sahara)	[2] 13,786	[3]	8,615	13,189	14,715
Gabon, Republic of	258	278	249	328	321
Morocco	154	352	299	436	[3]
Nigeria		4,939	13,802	18,159	[3]
Tunisia	225	252	256	262	272
Oceania: New Zealand	5	5	5	4	5

[1] Natural gas is produced in China, but there is no recent information available.
[2] Total production.
[3] Data not available.
[4] Estimate.
[5] Deliveries for sale.

NOTE.—The data relate, as far as possible, to natural gas actually collected and utilized as fuel or raw material. They exclude gas used for repressuring, as well as gas flared, vented, or otherwise wasted, whether or not it has first been processed for the extraction of natural gasoline.
For countries reporting in the metric system, the following conversion factor is used:

m^3 at 32° F (0° C) x 37.32 = ft.^{3} at 60° F.
(ft.^{3} at 60° F x 0.026795 = m^3 at 32° F)

TECHNOLOGY

Nuclear-Explosive Fracturing in Gas Reservoirs.—The Bureau of Mines is conducting a preliminary research study to determine the feasibility of stimulating natural gas production with nuclear explosives. Results of such work are expected to be applicable to fracturing thick gas-reservoir formations which do not produce commercial quantities of gas because of low permeability. Based on observations from previous underground nuclear blasts, it is expected that a multiple fracture system will extend in all directions

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from the cavity filled with broken rock that is formed by the explosion and subsequent caving. Such a fracture system would have a radius about five times as large as the cavity. This method offers a substantial advantage over conventional hydraulic-fracturing treatment which usually produces a single or only a few short horizontal or vertical fractures.

Evaluations are being made of oil and gas reservoirs in producing areas in the United States to which nuclear-explosion stimulations are considered most amenable. Site selection will follow and an experimental nuclear detonation in a gas reservoir is planned within a few years.

Liquefaction (Foreign)—Following 10 years of costly research and development, the first large-scale commercial project for liquefying and transporting natural gas is nearing completion. The project involves natural gas produced at Hassi R'Mel in the Sahara, North Africa, which will be liquefied at a plant at Arzew, Algeria. In the plant the gas is dried, purified, and then liquefied at a temperature of about minus 258° F using a cascade refrigeration cycle having two stages of propane, three of ethylene, and three of methane. About 100 million cubic feet of gas per day will be carried in specially equipped liquefied-methane tankers to United Kingdom markets, and another 50 million will go to France.

Liquefaction (Domestic)—The first United States commercial cryogenic inground storage pit for liquefied natural gas (LNG) was constructed in 1964 in Bergen County, N.J., for use in peak-shaving. The project has capacity to store 1 billion cubic feet of gas as a liquid and can convert the liquid to gas and deliver 200 million cubic feet per day. Large-volume customers thus are relieved from having to provide standby facilities.

In this project the frozen-earth technique was used to excavate water-soaked earth. Key to the technique is methane's low boiling point (minus 258° F). At this low temperature, water in the soil freezes and permits the soil to be excavated much as rock. In operation, during an extended period, the zone of frozen earth gradually will thicken to seal and insulate the storage pit and further reduce heat leakage.

Plant Liquefaction of Natural Gas—A new application of known cryogenic processes and refrigerated-storage technology is to be applied on the West Coast to provide liquefied natural gas for use in peak-shaving. In this installation gas is to be delivered from the field to the plant near the point of use at 300 psig. After being purified, the gas will be expanded through an efficient refrigeration cycle to a pressure of 50 psig, which is an ample pressure for further distribution. In the process about 10 percent of the gas is liquefied and can be stored for use in subsequent peak-shaving.

The installation includes a liquefaction plant with a design capacity of 2 million cubic feet per day, aboveground storage for 175,000 barrels of liquid product, and a regasifier having a capacity of 60 million cubic feet per day.

Removing Heavy Brines from Gas Wells—Research has been conducted by the Bureau of Mines in cooperation with the American Gas Association on selection of effective foaming agents to remove heavy brines from gas wells. As a result of these studies foaming technology has

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been advanced and solutions have been achieved to many of the problems in removing brines containing high concentrations of sodium and calcium chlorides.

In these research studies standardized dynamic foam tests, which have a high degree of comparability and reproducibility, were performed, and several effective foaming agents were selected that can be expected to perform efficiently in some gas wells under the most severe saline conditions. Generalizations that are promising for future applications show the effectiveness of specific cationic and anionic detergent groups as foaming agents.

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Natural Gas Liquids

By I. F. Avery [1]

Contents

	Page		Page
General summary	361	Prices	376
Scope of report	361	Stocks	377
Districts	362	Storage	377
Reserves	364	Shipments of liquefied petroleum gases and ethane	379
Production	365	Foreign trade	386
Natural gas processed, yield and disposition of residue gas	367	Technology	387
Demand for natural gas liquids at plants and terminals	372		

GENERAL SUMMARY

The production of natural gas liquids in 1963 was 16,837 million gallons, a gain of 7.6 percent for the year. The output of all the products included in the total were above the 1962 level. A breakdown of the production by products and the percentage increases over the 1962 level are as follows: natural gasoline and isopentane, 4,899 million gallons, 2.7 percent; liquefied petroleum (LPG) gases, 9,352 million gallons, 5.6 percent; ethane, 951 million gallons, 11.5 percent; and other finished products (including finished gasoline, naphtha, jet fuel, kerosine, distillate fuel oil, other miscellaneous products and condensate) 1,636 million gallons, 11.0 percent.

The total value of the natural gas liquids at plants in 1963 was $798,943,000. This was slightly higher than in 1962, but the average value per gallon produced declined from 5.1 cents in 1962 to 4.7 cents for 1963.

Shipments of liquefied gases and ethane for fuel and chemical uses were 11,570,278 thousand gallons in 1963, an increase of 7.8 percent for the year. Shipments of natural gas liquids to refineries and terminals for use as blending material in motor fuel totaled 8,875 million gallons in 1963 compared with 8,236 million in 1962.

SCOPE OF REPORT

Statistics on natural gas liquids are collected by the Bureau of Mines from reports submitted by natural gasoline plants, cycling plants, and fractionators that handle natural gas liquids. Informa-

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tion on production, stocks, and distribution is obtained from monthly reports. Annual reports provide data on type of plant, production, value of production, and volume of gas processed. Reports submitted to the Bureau cover all except the small volume of natural gas liquids recovered at pipeline compressor stations and gas-dehydration plants. Such recovery is considered to be of little significance in the national and State totals. Plant condensate is included in the category of natural gas liquids. Field condensate, however, is reported with crude oil and is excluded from the total for natural gas liquids. LR gases and ethane produced at petroleum refineries are not natural gas liquids, but to obtain complete distribution of liquefied gases, the sales data shown in this chapter cover the products of natural gasoline plants and petroleum refineries.

Data on shipments of LP gases are collected by the Bureau of Mines from annual reports received from all producers and distributors and from most of the dealers that sell over 100,000 gallons of LP gases annually. The reported sample of dealer shipments is expanded by Petroleum Administration for Defense (PAD) districts on the basis of the domestic demand in the districts.

Data on shipments of LP gases used as fuels or chemicals include data on ethane and liquefied gas produced at natural gasoline plants and at petroleum refineries; they exclude, however, data on LP gases blended into motor fuel.

Liquefied gases and ethane, whether obtained from natural gas or from processing in refineries, are defined as follows:

Ethane.—Includes all ethane, ethylene, and mixtures containing more than 50 percent of either.

Propane.—Includes all products covered by Natural Gas Processors Association specifications for commercial propane.

Butane-propane.—Includes all products covered by NGPA specifications for commercial butane-propane mixtures.

Butanes.—Includes all products covered by NGPA specifications for commercial butane, except those that contain 60 percent or more isobutane.

Isobutane.—Includes all products covered by NGPA specifications for commercial butane that contain 60 percent or more isobutane.

Other mixtures of liquefied petroleum gases.—Includes mixtures that cannot be classified within the five classifications mentioned, such as mixtures containing less than 50 percent ethane but more than 50 percent propane and butane.

DISTRICTS

The Bureau reports the production of natural gas liquids by States. Louisiana and Texas are also reported by districts.

Louisiana is divided into an Inland district and a Gulf Coast district. The Gulf Coast district includes Vernon, Rapides, Avoyelles, Pointe Coupee, West Feliciana, East Feliciana, Tangipahoa, St. Helena, and Washington Parishes and all parishes in the State south of these. All parishes not included in the Gulf Coast district are in the Inland district.

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TABLE 1.—Salient statistics of the natural gas liquids industry in the United States, 1959–63

(Thousands of gallons unless otherwise stated)

	1959	1960	1961	1962	1963
Production:					
Natural gasoline and isopentane	4,222,266	4,479,454	4,666,319	4,772,260	4,899,323
LP gases and ethane	7,874,706	8,444,074	9,085,465	9,409,083	10,302,250
Finished gasoline and naphtha	660,666	503,659	473,496	450,991	499,901
Other finished products and condensate	714,170	859,394	965,648	1,021,271	1,135,743
Total	13,471,808	14,286,581	15,190,928	15,653,605	16,837,217
Shipments for use in gasoline [1]	7,067,963	7,522,372	7,973,162	8,235,864	8,874,602
Transfers to nongasoline uses (fuel and chemical):					
LP gases and ethane [2]	6,149,430	6,391,217	6,693,573	7,506,776	7,645,055
Other finished products	158,708	212,483	197,823	171,165	211,558
Stocks at plants, terminals, and refineries:					
Natural gasoline	170,058	197,559	198,608	174,835	168,228
LP gases	790,579	946,758	1,294,090	1,057,295	1,166,056
Other finished products	84,606	70,507	64,120	86,034	83,078
Total	1,045,243	1,214,824	1,556,818	1,318,164	1,417,362
Value of natural gas liquids at plants thousand dollars	758,496	808,385	782,205	798,151	798,943
Average value per gallon cents	5.6	5.7	5.1	5.1	4.7
Natural gas processed million cubic feet	9,186,862	9,768,189	10,261,669	11,089,241	12,430,353
Average yield, all natural gas liquids gallons per thousand cubic feet	1.47	1.46	1.48	1.41	1.35
Shipments for fuel and chemical uses:					
Liquified petroleum gas and ethane (LP gases)	6,047,061	6,332,699	6,482,109	7,502,702	7,565,284
Liquefied refinery gas and ethane (LR gases)	2,872,100	3,211,950	3,315,774	3,226,692	4,004,994
Total	8,919,161	9,544,649	9,797,883	10,729,394	11,570,278
Exports of natural gasoline, LP gases, and LR gases	94,620	125,590	[3] 149,044	[3] 162,968	193,887
Imports of LP gases and LR gases	[4]	68,502	75,852	94,416	104,790

[1] Includes exports of natural gasoline.
[2] Includes exports of LP gases.
[3] Revised figure.
[4] Imports of liquefied gases included with gasoline.

The Bureau of Mines producing districts in Texas correspond, with one exception, to groupings of the Texas Railroad Commission districts:

Bureau of Mines districts:	*Railroad Commission district*
Gulf Coast	Nos. 2 and 3
West Texas	Nos. 7C and 8
East Proper	Part of No. 6 (East Texas field in Cherokee, Smith, Upshur, Rush, and Gregg Counties)
Panhandle	No. 10
Rest of State:	
North	Nos. 7B and 9
Central	No. 1
South	No. 4
Other East Texas	Nos. 5 and 6 (exclusive of East Proper)

The Bureau of Mines groups refinery operations into another set of districts called refining districts. These refining districts correspond with the grouping originated by the Petroleum Administration for War during World War II and called PAW districts (later changed to PAD districts).

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PAD district:	*Refining district*
1	*East Coast*—District of Columbia and Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida, and the following counties of New York: Cayuga, Tompkins, Chemung and all counties east and north thereof, and the following counties of Pennsylvania: Bradford, Sullivan, Columbia, Montour, Northumberland, Dauphin, York, and all counties east thereof.
1	Appalachian No. 1—West Virginia and those parts of Pennsylvania and New York not included in the East Coast district.
2	Appalachian No. 2—The following counties of Ohio: Erie, Huron, Crawford, Marion, Delaware, Franklin, Pickaway, Ross, Pike, Scioto, and all counties east thereof.
2	*Indiana-Illinois-Kentucky*—Indiana, Illinois, Kentucky, Tennessee, Michigan, and that part of Ohio not included in the Appalachian district.
2	*Oklahoma-Kansas-Missouri*—Oklahoma, Kansas, Missouri, Nebraska, and Iowa.
2	*Minnesota-Wisconsin-North Dakota-South Dakota*—Minnesota, Wisconsin, North Dakota, and South Dakota.
3	*Texas Inland*—Texas, except Texas Gulf Coast district.
3	*Texas Gulf Coast*—The following counties of Texas: Newton, Orange, Jefferson, Jasper, Tyler, Hardin, Liberty, Chambers, Polk, San Jacinto, Montgomery, Harris, Galveston, Waller, Fort Bend, Brazoria, Wharton, Matagorda, Jackson, Victoria, Calhoun, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron.
3	*Louisiana Gulf Coast*—The following parishes of Louisiana: Vernon, Rapides, Avoyelles, Pointe Coupee, West Feliciana, East Feliciana, Tangipahoa, St. Helena, Washington, and all parishes south thereof; the following counties of Mississippi: Pearl River, Stone, George Hancock, Harrison, and Jackson, and Mobile and Baldwin Counties, Alabama.
3	*North Louisiana-Arkansas*—and those parts of Louisiana, Mississippi and Alabama not included in the Louisiana Gulf Coast district.
3	*New Mexico*—New Mexico.
4	*Rocky Mountain*—Montana, Idaho, Wyoming, Utah, and Colorado.
5	*West Coast*—Washington, Oregon, California, Nevada, Alaska, Arizona, and Hawaii.

Some data in this chapter are based on the Bureau of Mines refining districts, while others refer to the PAD districts. Maps showing the PAD and Bureau of Mines refining districts appear in Figure 2 of the "Petroleum" chapter of the Minerals Yearbook.

RESERVES

The American Gas Association Reserves Committee has estimated the total proved reserves of natural gas liquids in the United States, as of December 31, 1963, to be 7,674 million barrels, an increase of 362 million barrels for the year. Texas, which accounts for 53 percent of the total natural-gas-liquids reserves, increased 213 million barrels, and Louisiana with 24 percent of the total, increased reserves 143 million barrels. Reserves decreased in 12 of the 20 states reported.

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TABLE 2.—Estimated proved recoverable reserves of natural gas liquids[1] in the United States

(Thousand barrels)

State	Reserves as of Dec. 31, 1962	Changes in reserves during 1963			Reserves as of December 31, 1963			
		Extensions and revisions	Discoveries of new fields and new pools	Net production	Nonassociated with oil	Associated with oil	Dissolved in oil	Total
Arkansas	19,744	1,495	77	2,621	2,147	7955	8,593	18,695
California[2]	299,685	15,728	150	25,493	0	93,587	196,483	290,070
Colorado	21,361	4,055	153	3,579	4,020	2,528	15,442	21,990
Illinois	4,976	−590	25	667	0	0	3,744	3,744
Indiana	93	20	1	19	3	3	89	95
Kansas	179,096	−3,183	1,047	7,719	159,210	7,657	2,374	169,241
Kentucky	50,666	2,303	1,151	3,115	[3] 51,005	0	0	51,005
Louisiana[2]	1,697,809	168,492	97,393	122,871	1,571,906	206,806	62,111	1,840,823
Michigan	5,424	910	38	1,046	2,048	1,070	2,208	5,326
Mississippi	36,015	−487	607	2,987	26,169	2,054	4,925	33,148
Montana	10,488	29	0	539	1,873	0	8,105	9,978
Nebraska	3,793	−741	0	277	1,630	149	996	2,775
New Mexico	517,209	71,449	1,404	31,829	373,336	49,403	135,494	558,233
North Dakota	78,775	5,700	0	2,458	0	12,537	69,480	82,017
Oklahoma	347,003	1,194	5,768	25,772	177,551	52,389	98,253	328,193
Pennsylvania	1,506	0	0	69	1,437	0	0	1,437
Texas[2]	3,829,381	416,434	64,026	267,483	2,077,403	680,525	1,284,430	4,042,358
Utah	48,788	238	0	2,435	509	12,000	34,082	46,591
West Virginia	58,859	11,996	5,998	8,074	[3] 68,779	0	0	68,779
Wyoming	100,835	5,152	99	6,606	52,610	723	46,147	99,480
Miscellaneous[4]	11	−11	0	0	0	0	0	0
Total	7,311,517	700,183	177,937	515,659	4,571,636	1,129,386	1,972,956	7,673,978

[1] Comprises natural gasoline, LP-gases and condensate.
[2] Includes offshore reserves.
[3] Not allocated by types but occurring principally in column shown.
[4] Includes Alabama and Florida.

Source: Committee on Natural Gas Reserves, American Gas Association.

PRODUCTION

Since 1958, new production levels have been attained each year. For 1963 production was 16,837 million gallons. This exceeded the previous high by 1,184 million gallons. Production of LP gases and ethane increased 893 million gallons. Propane, which represented 50 percent of all LP gases produced in 1963, totaled 5,173 million gallons, 620 million gallons more than 1962. Ethane production also showed a substantial increase for the year, up 398 million gallons. Production of natural gasoline and cycle products increased to 6,535 million gallons, a gain of 290 million gallons for the year.

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TABLE 3.—Natural gas liquids produced, value at plants, and gas processed in the United States in 1963, by States

State	Number of operators [2]	Natural gasoline [1]			LP gases and ethane			Finished gasoline and naphtha		
		Thousand gallons	Thousand dollars	Cents per gallon	Thousand gallons	Thousand dollars	Cents per gallon	Thousand gallons	Thousand dollars	Cents per gallon
Arkansas	5	22,375	1,271	5.7	66,377	2,497	3.8	--------	--------	--------
California	20	681,065	51,381	7.5	393,503	17,329	4.4	--------	--------	--------
Colorado	8	56,869	3,191	5.6	91,309	4,171	4.6	--------	--------	--------
Illinois	3	14,742	1,061	7.2	337,278	14,714	4.4	197	16	8.1
Kansas	12	160,923	9,617	6.0	395,877	15,481	3.9	--------	--------	--------
Kentucky [3]	8	22,451	1,696	7.6	252,477	10,433	4.1	--------	--------	--------
Louisiana	38	464,654	30,846	6.6	1,113,670	41,043	3.7	244,897	21,091	8.6
Mississippi	5	27,340	1,663	6.1	24,541	956	3.9	--------	--------	--------
Montana [4]	4	33,055	1,790	5.4	77,188	2,377	3.1	--------	--------	--------
Nebraska	3	10,119	687	6.8	25,931	1,207	4.7	--------	--------	--------
New Mexico	12	285,323	17,204	6.0	728,200	21,801	3.0	--------	--------	--------
North Dakota	3	20,511	1,339	6.5	79,653	3,166	4.0	--------	--------	--------
Oklahoma	36	464,137	28,817	6.2	810,894	28,981	3.6	2,324	212	9.1
Pennsylvania	4	1,311	78	5.9	1,721	118	6.9	--------	--------	--------
Texas	90	2,508,343	160,556	6.4	5,366,831	169,695	3.2	252,483	19,603	7.8
West Virginia [5]	9	41,721	3,520	8.4	386,863	19,598	5.1	--------	--------	--------
Wyoming	11	84,384	5,414	6.4	150,437	6,223	4.1	--------	--------	--------
Total	164	4,899,323	320,131	6.5	10,302,250	359,770	3.5	499,901	40,922	8.2

State	Other products [6]			Total natural gas liquids			Natural gas processed	
	Thousand gallons	Thousand dollars	Cents per gallon	Thousand gallons	Thousand dollars	Cents per gallon	Million cubic feet	Average yield (gallons per cubic foot)
Arkansas	3,844	195	5.1	92,596	3,963	4.3	132,535	0.70
California	34,238	2,807	8.2	1,108,806	71,517	6.4	549,077	2.02
Colorado	--------	--------	--------	148,178	7,362	5.0	121,043	1.22
Illinois	--------	--------	--------	352,217	15,791	4.5	[7] 199,877	1.76
Kansas	4,447	194	4.4	561,247	25,292	4.5	687,331	0.82
Kentucky [3]	--------	--------	--------	274,928	12,129	4.4	[7] 295,450	0.92
Louisiana	434,156	29,395	6.8	2,257,377	122,375	5.4	2,646,572	0.85
Mississippi	1,417	92	6.5	53,298	2,711	5.1	90,459	0.59
Montana [4]	--------	--------	--------	110,243	4,167	3.8	50,986	2.16
Nebraska	--------	--------	--------	36,050	1,894	5.3	10,667	3.38
New Mexico	6,065	351	5.8	1,019,588	39,356	3.9	696,880	1.46
North Dakota	--------	--------	--------	100,164	4,505	4.5	32,854	3.05
Oklahoma	89,006	6,102	6.9	1,366,361	64,112	4.7	878,755	1.55
Pennsylvania	--------	--------	--------	3,032	196	6.5	3,127	0.97
Texas	559,590	38,816	6.9	8,687,247	388,670	4.5	5,665,071	1.53
West Virginia [5]	1,350	59	4.4	429,434	23,177	5.4	[7] 209,324	2.05
Wyoming	1,630	109	6.7	236,451	11,726	5.0	157,345	1.50
Total	1,135,743	78,120	6.9	16,837,217	796,943	4.7	12,430,353	1.35

[1] Includes isopentane.
[2] A producer operating in more than 1 State is counted but once in arriving at total United States.
[3] Michigan (4 operators) included with Kentucky.
[4] Utah (2 operators) included with Montana.
[5] Florida (1 operator) included with West Virginia.
[6] Includes condensate, kerosine, jet fuel, distillate, etc.
[7] Includes gas from transmission lines previously treated in another State.

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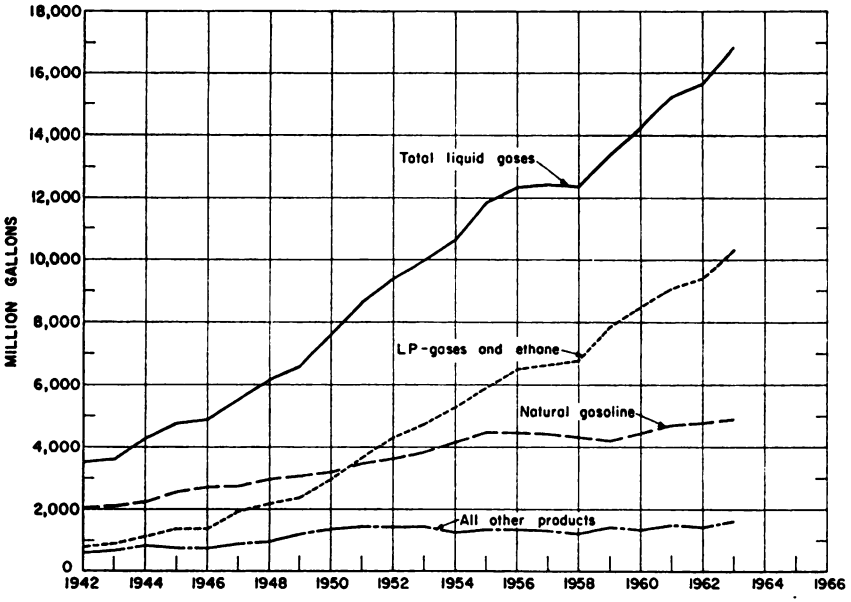

FIGURE 1.—Production of natural gas liquids in the United States, 1942–63.

NATURAL GAS PROCESSED, YIELD, AND DISPOSITION OF RESIDUE GAS

The average yield of natural gas liquids per thousand cubic feet of natural gas processed in 1963 was 1.35 gallons compared with 1.41 gallons in 1962. The total volume of natural gas processed was 12,430 billion cubic feet.

Data on the number of natural gas processing plants and their throughput capacity at the end of 1963 is not available at this time. As of December 31, 1962, there were 616 plants in operation with an average annual output per plant of 25,412 million gallons.

Table 5 shows the disposition of residue gas and the volume of gas loss (shrinkage) by the extraction of the natural gas liquids. Before 1962 the extraction loss per gallon of liquids produced was considered to approximate 34 cubic feet. Better reporting of the ethane component necessitated revising the previous extraction loss factor. According to data compiled for 1962 and 1963, the extraction loss averaged 40 cubic feet per gallon.

Residue gas is defined as that gas which remains after the natural gas liquids have been extracted at the processing plants. In 1963 this totaled 11,760,102 million cubic feet, 83 percent of which was marketed, 13 percent was returned to the well for repressuring, and 4 percent was used as fuel at the processing plant.

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TABLE 4.—Monthly production of natural gas liquids in the United States in 1963, by States and districts [1]

(Thousand gallons)

States by petroleum districts [1]	January	February	March	April	May	June	July	August	September	October	November	December	Total
District 1:													
Western Pennsylvania	324	296	298	301	281	239	227	193	181	210	219	263	3,032
West Virginia and Florida	33,455	31,426	36,016	36,006	33,272	33,748	36,507	37,401	36,768	38,181	37,834	38,820	429,434
Total	33,779	31,772	36,314	36,307	33,553	33,987	36,734	37,594	36,949	38,391	38,053	39,083	432,466
District 2:													
Illinois	27,313	28,572	30,518	23,888	27,975	27,425	29,970	30,884	29,470	30,757	32,479	32,966	352,217
Kentucky and Michigan	22,520	21,628	22,079	20,238	21,531	21,139	23,360	24,628	22,070	24,364	24,173	27,198	274,928
Kansas	38,913	47,443	52,318	37,467	42,793	45,469	40,939	53,813	46,189	41,425	50,988	63,490	561,247
Nebraska	4,055	3,661	3,652	3,015	2,746	2,534	2,475	2,520	2,438	2,785	3,118	3,051	36,050
North Dakota	8,696	8,572	8,374	7,695	7,917	5,270	8,479	9,288	8,419	9,606	8,960	8,888	100,164
Oklahoma	117,561	110,837	121,311	108,783	115,025	104,388	112,804	114,172	112,083	110,301	118,129	120,967	1,366,361
Total	219,058	220,713	238,252	201,086	217,987	206,225	218,027	235,305	220,669	219,238	237,847	256,560	2,690,967
District 3:													
Arkansas	7,490	6,990	7,752	7,583	7,645	7,903	8,027	7,925	7,695	8,058	7,858	7,670	92,596
Louisiana:													
Gulf	140,266	130,953	136,281	125,377	129,325	123,703	130,415	131,592	124,019	144,465	139,142	145,820	1,601,358
Inland	55,308	51,274	53,485	54,600	57,019	53,718	55,864	55,253	52,652	49,822	58,102	58,922	656,019
Total Louisiana	195,574	182,227	189,766	179,977	186,344	177,421	186,279	186,845	176,671	194,287	197,244	204,742	2,257,377
Mississippi and Alabama	4,228	4,063	4,836	4,538	4,843	4,584	4,728	4,745	4,465	4,439	3,820	4,009	53,298
New Mexico	82,102	71,689	83,810	90,946	86,797	82,256	85,214	88,645	84,556	86,585	88,047	88,941	1,019,588
Texas:													
Gulf	160,008	160,357	168,483	158,232	164,732	159,587	165,598	166,345	160,265	168,885	163,404	171,622	1,967,518
West	215,287	220,873	227,348	222,815	233,554	228,150	235,890	241,085	237,778	235,139	223,988	221,597	2,743,504
East (Field)	17,646	15,883	17,620	17,231	18,013	17,895	18,537	18,580	17,536	17,626	15,987	15,169	207,723
Panhandle	113,424	110,709	120,123	94,492	100,506	95,983	103,302	108,386	105,898	110,963	118,714	117,926	1,300,426
Rest of State (Other)	214,987	197,270	209,498	195,811	201,035	199,419	204,343	204,398	197,317	210,553	208,703	224,742	2,468,076
Total Texas	721,352	705,092	742,972	688,581	717,840	701,034	727,670	738,794	718,794	743,166	730,796	751,056	8,687,247
Total	1,010,746	970,061	1,029,236	971,625	1,003,469	973,198	1,011,918	1,026,954	992,181	1,036,535	1,027,765	1,056,418	12,110,106

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District 4:													
Colorado	14,680	12,772	13,477	11,031	11,565	11,601	11,293	11,157	10,886	12,603	13,909	13,204	148,178
Montana and Utah	7,789	8,821	10,096	9,130	9,655	9,419	9,853	9,428	9,321	9,597	8,738	8,396	110,243
Wyoming	21,840	19,453	21,449	19,936	19,468	18,367	18,171	17,023	17,787	20,336	20,896	21,725	236,451
Total	44,309	41,046	45,022	40,097	40,688	39,387	39,317	37,608	37,994	42,536	43,543	43,325	494,872
District 5	99,942	86,189	96,263	92,038	92,525	87,315	89,888	91,047	88,697	95,017	92,552	97,333	1,108,806
Grand total	1,407,834	1,349,731	1,445,087	1,341,153	1,388,222	1,340,112	1,395,884	1,428,508	1,376,490	1,431,717	1,439,760	1,492,719	16,837,217

[1] West Pennsylvania separated from eastern part of State to allow grouping in either Bureau of Mines refinery district or Petroleum Administration for Defense district. Districts shown for Texas and Louisiana are Bureau of Mines production districts. (These districts are described under the heading "Districts.")

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TABLE 5.—Liquefied production at natural gas processing plants and disposition of residue gas in the United States in 1962–63, by States

(Million cubic feet)

State	Total natural gas liquids production	Natural gas processed	Extraction loss (shrinkage)	Disposition of residue gas					
				Used at plants	Returned to formation	Vented or flared	Pipeline		Total residue gas
							Returned to producer	To other companies	
1962:									
Arkansas	98,867	121,911	5,046	3,672	17,891	49	627	94,626	116,865
California	1,124,282	539,594	37,674	34,891	188,555	734	93,632	184,108	501,920
Colorado	161,345	83,643	6,479	5,068	31,267	19	7,945	82,845	77,164
Illinois	340,931	[1] 197,180	13,011	1,634	----------	8	182,000	527	184,169
Kansas	318,129	592,035	11,253	5,820	----------	64	344,736	230,162	580,782
Kentucky [2]	277,668	329,137	16,688	1,905	----------	145	298,175	12,224	312,449
Louisiana	1,872,909	2,015,188	52,218	43,704	238,986	1,312	109,431	1,569,537	1,962,970
Mississippi	46,292	95,486	2,034	2,508	31,124	243	6,441	53,136	93,452
Montana [3]	120,372	53,890	3,963	3,785	4,930	----------	2,129	39,083	49,927
Nebraska	40,957	11,675	930	587	289	----------	1,855	8,014	10,745
New Mexico	935,299	732,421	39,764	30,166	3,510	20,394	99,009	539,578	692,657
North Dakota	85,753	23,162	4,293	3,446	----------	1,526	2,691	11,206	18,869
Oklahoma	1,391,698	880,422	54,811	48,772	118,777	529	73,330	584,203	825,611
Pennsylvania	2,871	2,555	109	30	13	----------	1,131	1,272	2,446
Texas	8,217,808	4,997,825	353,500	253,279	842,713	17,424	627,209	2,903,700	4,644,325
West Virginia [4]	390,206	241,136	13,556	11,697	----------	----------	172,024	43,859	227,580
Wyoming	228,218	171,981	8,287	7,765	25,022	859	5,267	124,781	163,694
Total	15,653,605	11,089,241	623,616	458,749	1,503,077	43,306	2,027,632	6,432,861	10,465,625

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1963:									
Arkansas	92,596	132,535	4,705	3,430	19,191	30	639	104,540	127,830
California	1,108,806	549,077	38,393	33,330	191,007	386	86,367	199,094	510,684
Colorado	148,178	121,043	6,447	4,954	31,005	21	7,705	70,911	114,596
Illinois	352,217	[1] 199,877	13,674	1,845	----------	----------	184,180	178	186,203
Kansas	561,247	687,331	11,378	6,957	----------	86	392,854	276,056	675,953
Kentucky [2]	274,928	[1] 298,450	14,404	3,185	----------	259	234,044	46,558	284,046
Louisiana	2,257,377	2,646,572	62,053	50,876	198,358	1,736	280,047	2,053,502	2,584,519
Mississippi	53,298	90,459	1,787	2,587	25,357	93	8,798	51,837	88,672
Montana [3]	110,243	50,986	3,923	4,116	13,216	141	2,911	26,679	47,063
Nebraska	36,050	10,667	1,436	1,793	256	----------	812	6,370	9,231
New Mexico	1,019,588	696,880	43,868	28,870	19,496	2,528	93,848	508,270	653,012
North Dakota	100,164	32,854	4,793	4,269	----------	1,022	3,629	19,141	28,061
Oklahoma	1,366,361	878,755	52,578	47,486	85,105	3,771	90,966	598,849	826,177
Pennsylvania	3,032	3,127	102	31	45	----------	2,949	----------	3,025
Texas	8,687,247	5,665,071	385,054	262,051	908,890	27,682	812,670	3,268,724	5,280,017
West Virginia [4]	429,434	[1] 209,324	16,980	10,113	----------	----------	130,077	52,154	192,344
Wyoming	236,451	157,345	8,676	7,199	14,183	211	4,826	122,250	148,669
Total	16,837,217	12,430,353	670,251	473,592	1,506,109	37,966	2,337,322	7,405,113	11,760,102

[1] Includes gas from transmission lines previously treated in another State.
[2] Michigan included with Kentucky
[3] Utah included with Montana.
[4] Florida included with West Virginia.

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DEMAND FOR NATURAL GAS LIQUIDS AT PROCESSING PLANTS AND TERMINALS

The total demand for natural gas liquids at plants and terminals in 1963 was 16,731 million gallons compared with 15,191 million gallons in 1962. Of this total 53 percent was shipped to refineries for use as blending fuel.

Motor Fuel Use.—Shipments of natural gas liquids for use as blending material for motor fuel were 8,875 million gallons in 1963, compared to 8,236 million gallons in 1962.

Other Uses.—Shipment of ethane used in the production of chemicals increased 12 percent. LP gases shipped for use in the manufacture of chemicals and for fuel use other than motor fuels totaled 6,693 million gallons compared with 6,659 million gallons in 1962. The other finished products shipped from natural gas processing plants were jet fuel, 26.1 million gallons; kerosine, 47.9 million gallons; distillate fuel oil, 19.7 million gallons; and miscellaneous finished products, 117.8 million gallons. Detailed use of liquefied gases are shown later in this chapter under the heading "Shipments of Liquefied Gases and Ethane."

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TABLE 6.—Supply and distribution at plants and terminals of natural gas liquids in the United States in 1963, by months

(Thousand gallons)

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Production:													
Natural gasoline	362,380	362,955	388,182	379,566	413,290	396,927	421,988	424,591	403,190	411,607	389,606	387,299	4,741,581
Ethane	69,261	72,695	79,407	68,142	77,545	78,249	84,440	81,091	76,228	84,624	87,461	91,378	950,521
LP gases:													
Propane	448,107	429,144	448,787	410,148	414,718	395,391	401,804	424,763	419,309	435,814	459,300	485,233	5,172,518
Butane, normal	195,062	191,145	203,288	185,437	184,107	181,516	187,972	201,478	196,464	210,717	203,441	216,090	2,356,717
Isobutane	78,583	67,189	82,728	81,557	78,152	76,755	76,085	77,320	76,378	75,102	80,576	83,113	933,538
Butane-propane mixture	53,524	45,307	47,821	48,111	46,808	43,972	49,783	45,628	36,985	37,842	36,984	40,407	533,172
Other LP gas mixtures	29,606	28,090	32,263	29,521	30,303	29,012	29,817	29,103	27,608	30,105	30,590	29,766	355,784
Isopentane	27,924	23,462	29,558	8,211	8,520	8,164	7,814	8,514	8,917	8,891	8,819	8,948	157,742
Finished gasoline and naphtha	43,285	37,831	39,743	40,352	41,308	39,882	41,406	40,974	38,819	42,398	46,034	47,869	499,901
Condensate, raw	81,088	73,651	75,982	71,714	75,351	73,078	76,926	76,162	73,818	78,676	79,082	84,083	919,611
Other finished products	19,014	18,262	17,328	18,394	18,120	17,166	17,849	18,884	18,774	15,941	17,867	18,533	216,132
Total	1,407,834	1,349,731	1,445,087	1,341,153	1,388,222	1,340,112	1,395,884	1,428,508	1,376,490	1,431,717	1,439,760	1,492,719	16,837,217
Stock change at plants and terminals	−301,300	−139,993	112,826	122,964	175,405	166,930	136,347	111,753	97,655	47,396	−81,578	−342,403	106,002
Shipments:													
For use in gasoline:													
Natural gasoline	354,176	365,024	380,675	391,542	405,742	407,270	421,510	430,573	413,048	387,955	392,112	403,925	4,753,552
LP gases:													
Propane	12,852	12,684	11,886	6,720	5,082	4,662	5,502	8,316	8,358	15,288	10,122	17,682	119,154
Butane, normal	112,746	91,071	85,645	104,025	98,187	90,516	60,622	100,098	113,520	173,606	186,204	169,547	1,385,787
Isobutane	83,772	60,255	76,727	84,387	71,451	62,952	78,902	68,742	79,932	72,388	73,020	86,695	899,223
Butane-propane mixture	4,872	5,334	3,276	2,814	2,394	3,318	420	5,544	3,654	5,964	5,964	5,334	48,888
Other LP gas mixtures	9,870	10,920	12,600	6,594	8,820	7,854	7,308	7,644	4,746	4,998	4,032	5,754	91,140
Isopentane	27,897	22,356	29,083	10,500	8,280	8,243	7,927	8,500	8,293	9,698	9,017	8,968	158,762
Finished gasoline and naphtha	37,147	38,724	40,053	46,207	45,901	43,345	38,528	45,358	38,893	39,438	42,595	42,966	499,155
Condensate	80,893	75,148	76,246	71,023	75,309	73,158	77,911	75,053	73,655	80,090	77,142	83,313	918,941
For other uses:													
Ethane	69,382	74,144	80,055	67,939	77,524	77,138	84,502	81,425	76,636	84,246	87,582	91,228	951,801
LP gases:													
Propane	711,611	559,668	387,754	284,470	293,024	286,786	308,872	339,814	309,854	339,884	446,755	722,272	4,990,764
Butane, normal	109,517	96,032	65,924	51,708	43,437	33,814	80,277	60,132	76,977	102,805	118,301	114,193	953,117
Isobutane	2,499	2,394	2,504	2,287	2,313	2,205	2,241	2,369	2,338	2,431	2,562	2,705	28,848
Butane-propane mixture	51,504	41,020	47,050	46,720	39,147	37,480	55,319	40,209	31,871	28,378	31,085	42,138	491,921
Other LP gas mixtures	18,790	14,192	16,826	23,222	20,536	17,087	12,607	26,333	21,237	19,979	18,767	19,028	228,604
Other finished products	21,606	20,758	15,957	18,031	15,670	17,354	17,089	16,645	15,823	17,173	16,078	19,374	211,558
Total demand for natural gas liquids at plants and terminals	1,709,134	1,489,724	1,332,261	1,218,189	1,212,817	1,173,182	1,259,537	1,316,755	1,278,835	1,384,821	1,521,338	1,835,122	16,731,215

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TABLE 7.—Natural gas liquids utilized at refineries in the United States in 1963, by Bureau of Mines refinery districts and by months [1]

(Thousand gallons)

District[2]	January	February	March	April	May	June	July	August	September	October	November	December	Total
East Coast	22,680	17,598	17,640	12,642	6,132	9,702	9,702	11,004	12,600	15,036	13,440	15,204	163,380
Appalachian	1,218	3,948	3,024	1,596	2,016	2,352	2,604	3,108	4,368	4,704	4,704	5,628	39,270
Indiana, Illinois, Kentucky, etc.	66,444	58,002	48,176	48,552	52,374	34,356	42,882	40,152	55,230	70,812	73,836	90,678	676,494
Minnesota, Wisconsin, North Dakota and South Dakota	5,166	4,788	4,788	3,948	3,318	2,814	5,460	6,174	7,224	6,090	6,510	6,384	62,664
Oklahoma, Kansas, Missouri	72,114	60,522	66,654	61,698	62,706	63,714	56,910	66,486	66,318	71,694	77,826	80,304	806,946
Texas:													
Inland	81,732	67,914	80,514	94,164	93,492	82,404	70,308	96,348	108,864	94,038	86,394	84,210	1,040,382
Gulf Coast	242,298	206,892	234,780	235,074	250,656	243,306	253,974	263,256	252,042	271,698	260,190	253,512	2,967,678
Total Texas	324,030	274,806	315,294	329,238	344,148	325,710	324,282	359,604	360,906	365,736	346,584	337,722	4,008,060
Louisiana-Arkansas:													
Louisiana Gulf Coast	70,812	63,966	58,002	54,054	50,484	50,064	49,896	52,164	51,114	57,120	55,188	60,228	673,092
Arkansas, Louisiana Inland	28,854	23,940	27,468	26,250	24,486	26,082	28,434	26,166	23,604	27,174	26,082	28,854	317,394
Total Louisiana-Arkansas	99,666	87,906	85,470	80,304	74,970	76,146	78,330	78,330	74,718	84,294	81,270	89,082	990,486
New Mexico	4,578	3,738	4,116	4,956	3,738	6,300	5,880	5,796	5,838	5,628	5,796	5,292	61,656
Other Rocky Mountain	15,498	14,028	15,414	13,986	13,776	13,440	13,860	13,188	13,398	15,372	15,204	16,170	173,334
West Coast	86,100	77,070	87,024	84,126	81,522	84,462	81,102	83,286	81,270	92,778	75,096	89,880	1,003,716
Total United States	697,494	602,406	642,600	641,046	644,700	618,996	621,012	667,128	681,870	732,144	700,266	736,344	7,986,006

[1] Excludes 888,596 gallons of natural gas liquids blended at terminal facilities.
[2] Districts are described under the heading "Districts."

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TABLE 8.—Percentage of natural gas liquids in refinery gasoline in the United States by Bureau of Mines refinery districts [1]

Year	East Coast	Appalachian	Indiana, Illinois, Kentucky, etc.	Minnesota, Wisconsin, North Dakota and South Dakota	Oklahoma, Kansas, Missouri, etc.	Texas Inland	Texas Gulf Coast	Louisiana Gulf Coast	Arkansas Louisiana Inland	Rocky Mountain	West Coast	Total
1959	1.2	[2]	4.4	3.3	10.6	35.6	14.4	11.0	25.3	6.7	12.5	10.4
1960	1.0	[2]	5.3	3.6	11.1	35.6	13.5	13.5	35.7	7.8	13.4	11.0
1961	1.1	[2]	4.9	4.6	12.4	30.9	15.2	13.4	33.9	8.5	12.7	11.2
1962	1.3	0.7	5.1	5.4	12.4	31.0	17.8	14.2	34.2	7.5	11.6	11.9
1963	1.9	2.7	5.5	6.1	12.4	31.1	18.7	11.7	30.7	9.3	11.0	11.9

[1] Bureau of Mines petroluem refining and PAD districts are described under the heading "Districts."
[2] Less than 0.5 percent.

TABLE 9.—Liquefied petroleum gas and ethane produced at natural gas processing plants in 1963

(Thousand gallons)

States by petroleum districts	Propane	Butane-propane mix	Butane	Isobutane	Other LP-gas	Total
District 1:						
Western Pennsylvania	991		730			1,721
West Virginia	[1] 96,523		[1] 58,383	7,738	[2] 223,719	[1] 386,363
Total	97,514		59,113	7,738	223,719	388,084
District 2:						
Illinois	131,868	306	20,761	13,571	[2] 170,772	337,278
Kentucky	[3] 68,890	[3] 5,286	[3] 11,331	14,326	[2] [3] 152,644	[3] 252,477
Michigan	[3]	[3]	[3]		[3]	[3]
Kansas	240,009	6,021	110,090	39,456	301	395,877
Nebraska	17,344		8,587			25,931
North Dakota	48,603	464	30,586			79,653
Oklahoma	517,041	43,447	193,822	51,189	5,395	810,894
Total	1,023,755	55,524	375,177	118,542	329,112	1,902,110
District 3:						
Arkansas	38,194	8,782	7,202	8,885	3,314	66,377
Louisiana:						
Gulf	489,723	24,466	180,841	118,830	[2] 18,037	831,897
Inland	138,670	56,396	59,191	27,516		281,773
Total, Louisiana	628,393	80,862	240,032	146,346	18,037	1,113,670
Mississippi	13,123	8,283	3,135			24,541
New Mexico	392,587	17,548	259,729	57,693	643	728,200
Texas:						
Gulf	377,456	49,744	157,133	123,533	[2] 365,878	1,073,744
West	1,133,820	105,544	604,970	81,848	101,437	2,027,619
East (Field)	78,709	2,095	42,726	707	11,153	135,390
Panhandle	337,804	18,049	203,254	210,687	19,403	789,197
Other	577,452	166,203	271,622	146,836	[2] 178,768	1,340,881
Total, Texas	2,505,241	341,635	1,279,705	563,611	676,639	5,366,831
Total, district 3	3,577,538	457,110	1,789,803	776,535	698,633	7,299,619
District 4:						
Colorado	56,188	23	8,592	7,611	18,895	91,309
Montana	[4] 39,805	2,640	[4] 34,743			[4] 77,188
Utah	[4]		[4]			[4]
Wyoming	97,597		48,654		4,186	150,437
Total	193,590	2,663	91,989	7,611	23,081	318,934
District 5	280,121	17,875	40,635	23,112	31,760	393,503
Grand total	5,172,518	533,172	2,356,717	933,538	[5] 1,306,305	10,302,250

[1] Florida included with West Virginia.
[2] Includes ethane production.
[3] Michigan included with Kentucky.
[4] Utah included with Montana.
[5] Includes 960,521,000 gallons of ethane production.

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TABLE 10.—Liquefied petroleum gas and ethane produced at refineries in 1963

(Thousand gallons)

States by Petroleum Districts	Propane	Butane-propane mix	Butane	Other LR gases	Total
District 1:					
East Coast [1]	254,982		46,662	9,912	311,556
West New York	22,554	168	420		23,142
Pennsylvania	146,580		5,124	16,254	167,958
West Virginia				2,016	2,016
Total	424,116	168	52,206	28,182	504,672
District 2:					
Illinois	185,094		7,350	14,028	206,472
Indiana	56,994		882		57,876
Kansas	83,580	672	29,736		113,988
Kentucky	[2] 35,532	[2] 378	[2] 42		[2] 35,952
Michigan	50,610		3,066	[3] 10,206	63,882
Minnesota	[4] 52,332	[4] 3,276	[4] 5,292	210	[4] 61,110
Missouri	(4)	(4)	(4)		(4)
North Dakota	(4)	(4)	(4)		(4)
Wisconsin	(4)	(4)			(4)
Ohio	128,142		3,486	21,840	153,468
Oklahoma	89,964	53,760	[5] 39,396	4,200	187,320
Total	682,248	58,086	89,250	50,484	880,068
District 3:					
Alabama	(6)	(6)			(6)
Arkansas	18,900	252	9,072		28,224
Louisiana:					
Gulf	201,684	9,744	15,792	[3] 226,884	454,104
Inland	252	2,856	2,478		5,586
Total Louisiana	201,936	12,600	18,270	[3] 226,884	459,690
Mississippi	[6] 7,938	[6] 1,050			[6] 8,988
New Mexico	4,746		7,896		12,642
Texas:					
Gulf	447,848	5,502	[5] 308,868	[3] 655,662	1,417,880
Inland	77,446	3,738	41,076	756	123,016
Total Texas	525,294	9,240	349,944	656,418	1,540,896
Total district 3	758,814	23,142	385,182	[3] 883,302	2,050,440
District 4:					
Colorado	6,930		1,932		8,862
Montana	9,576		3,318		12,894
Utah	26,880		714		27,594
Wyoming	6,342	336	[5] 9,492	3,108	19,278
Total	49,728	336	[5] 15,456	3,108	68,628
District 5	268,422	19,278	[5] 111,132	[3] 102,354	501,186
Grand total	2,183,328	101,010	[7] 653,226	[8] 1,067,430	4,004,994

[1] Excludes Pennsylvania.
[2] Tennessee included with Kentucky.
[3] Includes ethane production.
[4] Missouri, North Dakota, and Wisconsin included with Minnesota.
[5] Includes isobutane produced for petrochemical feedstock.
[6] Alabama included with Mississippi.
[7] Includes 7,182,000 gallons isobutane for petrochemical feedstock.
[8] Includes 278,082,000 gallons of ethane.

PRICES

The average value for all natural gas liquids at plants in 1963 was 4.7 cents per gallon, 0.4 cent less than 1962. The average value per gallon decreased for all products. The average price for natural

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gasoline and isopentane declined 0.5 cent; LP gases and ethane, 0.3 cent; finished gasoline and naphtha, 0.1 cent; and other finished and condensate, 0.3 cent; the average posted price for propane at New York Harbor in 1963, according to Platts' Oil Price Handbook, was 7.70 cents per gallon, 0.2 cent above the 1962 average.

STOCKS

Natural gas liquids stocks at plants and terminals increased 106 million gallons during the year, and stocks at refineries declined 7 million gallons.

TABLE 11.—Stocks of natural gas liquids in the United States

(Thousand gallons)

Date	Natural gasoline and isopentane		LP gases and ethane		Other finished products and plant condensate		Total at plants and terminals	Total at refineries [1]	Grand total [1]
	At plants and terminals	At refineries [1]	At plants and terminals	At refineries [1]	At plants and terminals	At refineries			
Dec. 31:									
1959	128,100	41,958	767,143	23,436	72,426	12,180	967,669	77,574	1,045,243
1960	143,295	54,264	920,340	26,418	64,543	5,922	1,128,178	86,604	1,214,782
1961	136,490	62,118	1,263,892	30,198	54,166	9,954	1,454,548	102,270	1,556,818
1962	113,179	61,656	1,019,747	37,548	61,422	24,612	1,194,348	123,816	1,318,164
1963:									
Jan. 31	121,410	50,190	706,475	36,246	65,163	27,258	893,048	113,694	1,006,742
Feb. 28	120,447	60,396	572,331	36,960	60,277	25,998	753,055	123,354	876,409
Mar. 31	128,429	69,552	676,378	37,254	61,074	32,256	865,881	139,062	1,004,943
Apr. 30	114,164	73,248	818,408	44,059	56,273	34,566	988,845	151,873	1,140,718
May 31	121,952	86,184	988,126	50,568	54,172	27,132	1,164,250	163,884	1,328,134
June 30	111,530	85,890	1,169,209	51,156	50,441	18,690	1,331,180	155,736	1,486,916
July 31	111,895	105,840	1,302,538	34,398	53,094	20,538	1,467,527	160,776	1,628,303
Aug. 31	105,927	103,236	1,421,295	33,390	52,058	22,218	1,579,280	158,844	1,738,124
Sept. 30	96,693	80,766	1,525,144	31,626	55,098	19,950	1,676,935	132,342	1,809,277
Oct. 31	119,538	58,632	1,549,381	34,146	55,412	20,370	1,724,331	113,148	1,837,479
Nov. 30	116,834	72,114	1,463,339	33,894	62,580	18,774	1,642,753	124,782	1,767,535
Dec. 31	100,188	68,040	[2] 1,132,750	33,306	67,412	15,666	1,300,350	117,012	1,417,362

[1] Includes benzol from nonpetroleum sources prior to 1960.
[2] Includes 833 million gallons in underground storage.

STORAGE

Storage facilities for LP and LR gases increased 201 million gallons for the year ending September 30, 1963. Above ground storage facilities increased 41 million gallons, and underground storage increased 160 million gallons. As of September 30, 1963, storage facilities for liquefied gases were filled to 52 percent of capacity compared to 51 percent a year ago.

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TABLE 12.—Liquefied petroleum gas storage capacity and stocks, Sept. 30, 1963.

(Thousand gallons)

State and District	Aboveground		Underground at plants, terminals, and refineries	Total	Stocks, September 30, 1963
	At plants and terminals	At refineries			
East Coast and Appalachian # 1 [1]	[1] 13,805	9,702	90,584		
Total PAD District I	13,805	9,702	90,584	114,091	40,399
Indiana, Illinois, Kentucky, and Appalachian # 2:					
Indiana	([2])	([2])	([4])		
Illinois	[3] 15,103	[3] 17,052	37,323		
Kentucky	4,410		([4])		
Ohio	735	[3] 12,264	([4])		
Michigan	529	2,352	[4] 146,845		
Tennessee		([3])			
Oklahoma, Kansas, Minnesota, and Wisconsin:					
Oklahoma	18,104	18,438	29,550		
Kansas	6,206	[5] 8,148	408,132		
Minnesota	([6])	3,738	13,650		
Missouri, Nebraska, North Dakota, Iowa, and Wisconsin	[5] 7,126	([5])	36,860		
Total PAD District II	52,213	61,992	672,360	786,565	457,140
Texas Inland:					
Panhandle	24,581	([7])	217,855		
East	5,520	([7])			
West	26,883	[7] 27,552	325,182		
Other	25,483	588	62,880		
Texas Gulf	26,939	40,362	1,150,073		
Louisiana Gulf and Alabama	16,316	[8] 16,548	272,318		
Arkansas and Louisiana Inland:					
Louisiana Inland	6,421	([8])	([9])		
Arkansas	1,594	([8])			
Mississippi	895	([8])	[9] 189,450		
New Mexico	10,345	([7])	53,038		
Total PAD District III	144,977	85,050	2,270,796	2,500,823	1,263,057
Rocky Mountain:					
Montana and Utah	1,565	[10] 1,344	[11] 13,400		
Wyoming	2,997	2,772	([11])		
Colorado	4,504	([10])			
Total PAD District IV	9,066	4,116	13,400	26,582	24,154
West Coast	3,373	32,928	35,700		
Total PAD District V	3,373	32,928	35,700	72,001	24,527
Total United States	223,434	193,788	3,082,840	3,500,062	[12] 1,809,277

[1] Includes storage capacity in Pennsylvania, West Virginia, Delaware, New Jersey, New York, and Florida.
[2] Indiana included in Illinois.
[3] Kentucky and Tennessee included in Ohio.
[4] Kentucky, Indiana, and Ohio included in Michigan.
[5] Missouri, North Dakota, and Wisconsin included with Kansas.
[6] Minnesota included in Missouri, Nebraska, North Dakota, etc.
[7] Panhandle, East Texas, and New Mexico included in West Texas.
[8] Louisiana Inland, Mississippi and Arkansas included in Louisiana Gulf and Alabama.
[9] Louisiana Inland included in Mississippi.
[10] Colorado included in Montana and Utah.
[11] Wyoming included in Montana and Utah.
[12] Includes 1,242 million gallons in underground storage at plants and terminals, and 180 million gallons in underground storage at petroleum refineries.

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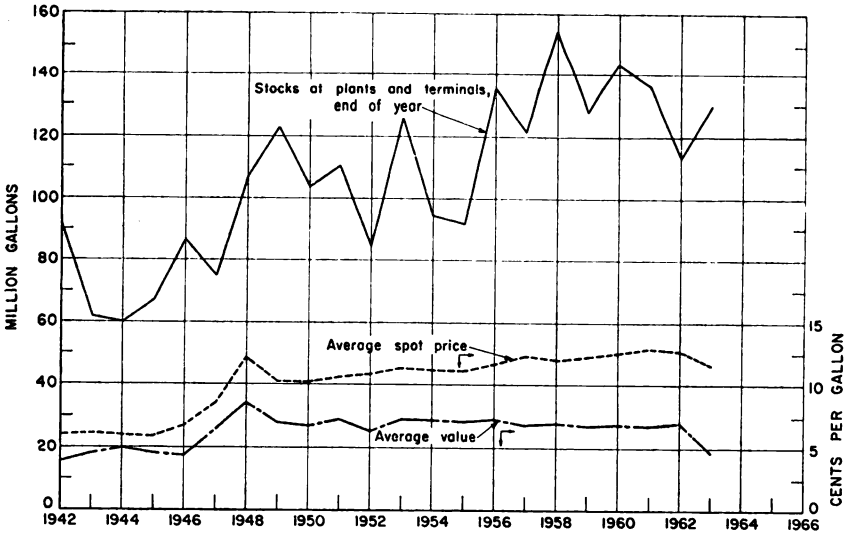

FIGURE 2.—Stocks of natural gasoline, average value of natural gasoline, and spot price of regular 91 octane motor gasoline at Oklahoma refineries.

SHIPMENTS OF LIQUEFIED PETROLEUM GASES [2] AND ETHANE IN 1963

The total shipments of liquefied petroleum gases for domestic uses,[3] excluding liquefied petroleum gases used in the production of gasoline, were 11,570,000 thousand gallons in 1963, an increase of 8 percent for the year. With the exception of liquefied petroleum gases used for secondary recovery of petroleum, which has been declining since 1959, other end-use categories increased in 1963. More than three quarters of the shipments of liquefied petroleum gases are for residential and commercial use, and for chemical manufacture. Residential and commercial use in 1963 totaled 5,053,000 thousand gallons, a 7 percent increase for the year, and that used for chemical manufacture increased 6 percent to 3,771,000 thousand gallons.

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[2] Data include liquefied refinery gases but exclude liquefied petroleum gases blended into gasoline.

[3] Description of the uses of liquefied petroleum gases reported in this section of the chapter:

Residential and Commercial.—All liquefied petroleum gases, by type, shipped or used in private households for heating, cooking, water-heating, and other household uses, such as clothes dryers and incinerators. Shipments to nonmanufacturing organizations, such as motels, restaurants, retail stores, laundries and other service enterprises, primarily for use in space heating, water-heating and cooking.

Internal-Combustion Engine Fuel.—All gases by type, used by tractors, irrigation engines, highway vehicles of all kinds, fork-lift and other industrial tractors and also oil-field drilling and production uses.

Industrial.—Liquefied petroleum gases shipped or used by manufacturing plants of all types for standby fuel, space heating, or other such uses as flame cutting, metallurgical furnaces, and plumber's torches.

Gas Companies.—Shipments made to gas utility companies for distribution through the mains.

Raw Material and Solvents for Chemical Plants and Synthetic Rubber Components.—Shipments of liquefied petroleum gases made to chemical plants and for use in the production of synthetic rubber.

All Other.—Liquefied petroleum gases shipped or used for agriculture purposes such as flame cultivation, crop drying, tobacco curing, poultry breeding, and miscellaneous other farm uses.

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TABLE 13.—Shipments of liquefied petroleum gases and ethane in the United States, 1959–63

(Thousand gallons)

	1959 [1]	1960 [2]	1961	1962	1963
United States, total	10,606,708	11,569,846	11,995,275	13,038,581	14,307,543
For export	94,529	125,537	149,052	162,735	193,073
For use in gasoline production	1,593,018	1,899,660	2,048,340	2,146,452	2,544,192
For all other uses	8,919,161	9,544,649	9,797,883	10,729,394	11,570,278
By type:					
Ethane	783,789	965,175	1,075,957	1,222,615	1,378,284
Propane	5,132,194	5,743,694	5,935,967	6,474,558	7,120,976
Butane	1,298,487	1,099,544	1,065,513	1,443,081	1,439,891
Isobutane	11,086	15,959	62,279	41,282	34,264
Butane-propane mixture	1,143,284	1,093,511	1,107,329	1,077,283	1,054,588
All other mixtures	550,321	626,766	550,838	470,575	542,275
By principal uses:					
Residential and commercial	3,934,792	4,224,537	4,318,215	4,712,682	5,053,157
Internal combustion	889,698	897,915	880,315	931,611	999,363
Industrial	439,200	438,659	402,428	424,730	493,208
Refinery fuel	136,830	157,036	166,572	231,084	356,958
Utility gas	182,903	157,041	168,989	173,481	216,627
Chemical	2,525,910	3,019,011	3,239,479	3,571,339	3,771,413
Synthetic rubber	513,941	538,971	519,637	587,379	599,556
Secondary recovery of petroleum	231,134	53,240	51,683	41,676	21,319
Miscellaneous uses	64,753	58,239	50,565	55,412	58,677

[1] Includes Alaska.
[2] Includes Alaska and Hawaii.

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TABLE 14.—Consumption of liquefied petroleum gases and ethane by use, excluding use in gasoline production, by PAD District and State

(Thousand gallons)

P.A.D. District and State	Residential and commercial		Internal combustion engine fuel		Industrial fuel		Utility gas		Miscellaneous uses		Total	
	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
District 1:												
Connecticut	34,815	35,116	649	472	10,040	13,373	2,716	7,019	1,547	1,433	49,767	57,413
Delaware	11,590	14,148	199	316	2,801	2,674	763	28	11	14	15,364	17,180
Florida	185,241	207,119	21,854	23,646	6,598	8,378	12,415	12,118	900	776	227,008	252,037
Georgia	123,883	130,748	18,305	19,348	6,668	10,980	16,950	11,837	3,876	4,111	169,682	177,024
Maine	21,117	23,778	119	270	1,056	1,683	----------	50	52	52	22,344	25,833
Maryland and District of Columbia	39,961	42,741	2,150	1,807	4,367	5,721	4,178	8,891	76	92	50,732	59,252
Massachusetts	39,769	40,964	792	1,160	4,500	5,066	7,563	8,198	211	117	52,835	55,505
New Hampshire	20,794	18,848	109	88	1,433	1,948	1,380	1,137	23	23	23,739	22,044
New Jersey	36,718	41,689	2,640	2,723	19,197	21,937	1,690	2,520	22	34	60,267	68,903
New York	108,492	117,873	4,964	5,194	9,551	11,915	702	1,931	110	104	123,819	137,017
North Carolina	93,958	104,309	1,717	2,040	8,024	10,213	1,016	1,186	11,372	12,660	116,087	130,408
Pennsylvania	62,136	67,543	5,208	6,842	27,840	29,197	2,468	4,177	60	99	97,712	107,858
Rhode Island	9,469	9,905	397	411	1,132	1,398	449	961	----------	----------	11,447	12,675
South Carolina	52,387	56,387	2,869	2,796	7,567	9,506	1,107	1,824	2,396	3,157	66,326	73,670
Vermont	12,428	11,951	35	84	1,562	1,242	3,612	1,465	21	8	17,658	14,750
Virginia	42,410	55,130	2,127	2,772	6,262	7,459	3,368	4,534	649	1,213	54,816	71,108
West Virginia	23,145	17,755	1,392	1,010	1,674	1,237	177	49	----------	----------	26,388	20,051
Total	918,313	996,004	65,526	70,979	120,272	143,927	60,554	67,925	21,326	23,893	[1] 1,674,888	[1] 1,773,132
District 2:												
Illinois	267,316	286,596	57,093	55,821	42,030	46,155	7,867	9,464	1,577	1,361	375,883	399,397
Indiana	182,474	202,636	9,765	10,493	45,375	51,662	4,379	6,632	1,227	1,418	243,220	272,841
Iowa	191,928	205,754	4,358	6,924	7,629	11,086	1,652	2,450	1,591	1,638	207,158	227,852
Kansas	195,875	200,993	44,379	50,378	3,739	7,142	177	403	865	551	245,035	259,467
Kentucky	70,849	83,973	5,979	6,954	2,284	3,046	6,247	8,271	407	584	85,766	102,828
Michigan	100,923	128,441	4,592	5,454	13,380	12,671	2,462	5,547	445	458	121,802	152,571
Minnesota	163,550	178,826	5,962	6,865	20,707	23,207	3,570	5,570	1,324	1,111	195,113	215,579
Missouri	272,990	309,167	9,346	10,607	7,512	7,561	2,968	9,083	549	379	293,365	336,797
Nebraska	107,159	129,746	14,314	19,014	1,310	1,512	859	2,986	391	583	124,033	153,841
North Dakota	40,572	42,305	6,461	7,549	4,288	8,201	1,659	1,729	780	800	53,760	60,584
Ohio	104,969	98,788	8,704	9,482	15,370	17,186	18,571	30,626	1,385	1,233	148,999	157,315
Oklahoma	227,756	248,610	61,137	73,258	9,290	10,496	7	----------	659	832	298,849	333,196
South Dakota	58,004	58,392	3,951	4,451	698	1,706	212	874	217	145	63,082	65,568
Tennessee	48,306	56,848	4,784	6,379	5,407	6,918	2,552	2,304	54	57	61,103	72,506
Wisconsin	160,092	179,082	5,191	5,590	25,245	34,282	3,078	2,912	700	699	194,306	222,565
Total	2,192,763	2,410,157	246,016	279,219	204,264	242,831	56,260	88,851	12,171	11,849	[1] 3,180,290	[1] 3,579,264

See footnote at end of table.

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TABLE 14.—Consumption of liquefied petroleum gases and ethane by use, excluding use in gasoline production, by PAD District and State—Continued

(Thousand gallons)

P.A.D. District and State	Residential and commercial		Internal combustion engine fuel		Industrial fuel		Utility gas		Miscellaneous uses		Total	
	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
District 3:												
Alabama	116,008	126,339	8,004	9,031	4,646	4,933	3,024	4,437	----------	311	131,682	145,051
Arkansas	156,009	149,760	60,446	61,814	3,138	1,677	----------	----------	1,996	1,640	221,589	214,891
Louisiana	93,282	91,652	48,406	53,785	11,055	12,653	----------	----------	704	699	153,447	158,789
Mississippi	136,894	143,915	46,000	52,926	1,390	1,682	63	81	2,446	2,323	186,793	200,927
New Mexico	76,426	77,315	23,044	21,946	1,631	835	250	300	814	778	102,165	101,174
Texas	503,303	517,610	356,972	374,290	26,700	23,939	747	757	8,660	10,693	896,382	927,289
Total	1,081,922	1,106,591	542,872	573,792	48,560	45,719	4,084	5,575	14,620	16,444	[1] 4,955,146	[1] 5,236,923
District 4:												
Colorado	102,980	102,428	10,171	10,471	3,479	3,284	2,092	470	1,015	1,211	119,737	117,864
Idaho	15,899	15,974	1,912	1,795	3,945	4,193	----------	----------	323	405	22,079	22,367
Montana	27,687	24,674	5,538	5,281	1,130	2,125	----------	----------	55	25	34,410	32,105
Utah	15,131	16,374	5,459	4,454	827	949	----------	----------	48	57	21,465	21,834
Wyoming	27,312	25,267	12,949	9,874	2,872	3,168	----------	----------	27	21	43,160	38,330
Total	189,009	184,717	36,029	31,875	12,253	13,719	2,092	470	1,468	1,719	[1] 264,286	[1] 259,735
District 5:												
Alaska	2,279	3,299	2	12	65	----------	----------	----------	----------	----------	2,346	3,311
Arizona	35,464	35,830	4,677	5,483	398	388	----------	----------	574	592	41,113	42,293
California	215,826	233,962	33,307	33,799	29,843	36,090	25,131	26,494	5,235	3,245	309,342	333,590
Hawaii	4,973	4,783	----------	129	----------	361	2,242	4,437	----------	----------	7,215	9,710
Nevada	19,389	20,977	479	817	163	224	14,654	15,486	18	----------	34,703	37,504
Oregon	17,919	20,249	1,281	1,675	6,314	6,780	8,252	7,181	----------	84	33,766	35,969
Washington	34,825	36,588	1,422	1,583	2,598	3,169	212	208	----------	851	39,057	42,399
Total	330,675	355,688	41,168	43,498	39,381	47,012	50,491	53,806	5,827	4,772	[1] 654,784	[1] 721,224
Total U.S. shipments	4,712,682	5,053,157	931,611	999,363	424,730	493,208	173,481	216,627	55,412	58,677	10,729,394	11,570,278

[1] District totals do not equal the sum of State totals due to the inclusion in District totals and the exclusion in State totals of figures for refinery fuel, chemical, synthetic rubber, and secondary recovery uses to avoid disclosing company data. Data for these uses are shown in Table 16.

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TABLE 15.—Consumption of liquefied petroleum gases and ethane, by type, by PAD district and state: 1962 and 1963

(Thousand gallons)

P.A.D. District and State	Propane		Butane		Butane-propane mixture		Total	
	1962	1963	1962	1963	1962	1963	1962	1963
District 1:								
Connecticut	49,715	57,373	32	22	20	18	49,767	57,413
Delaware	15,325	17,114			39	66	15,364	17,180
Florida	187,791	215,222	1,752	357	37,465	36,458	227,008	252,037
Georgia	133,853	141,535	3,317	2,577	32,512	32,912	169,682	177,024
Maine	22,344	25,833					22,344	25,833
Maryland and District of Columbia	50,205	58,989	160		367	263	50,732	59,252
Massachusetts	52,835	55,289				216	52,835	55,505
New Hampshire	23,322	21,398	417	646			23,739	22,044
New Jersey	59,985	68,555		13	282	335	60,267	68,903
New York	122,195	135,602	20	24	1,604	1,391	123,819	137,017
North Carolina	113,459	128,067	36	38	2,592	2,303	116,087	130,408
Pennsylvania	90,629	102,261	3,349	1,885	3,734	3,712	97,712	107,858
Rhode Island	11,447	12,675					11,447	12,675
South Carolina	57,370	66,041	167	69	8,789	7,560	66,326	73,670
Vermont	17,658	14,750					17,658	14,750
Virginia	54,518	70,660	298	437		11	54,816	71,108
West Virginia	26,344	20,022			44	29	26,388	20,051
Total [1]	1,153,506	1,250,757	74,947	69,151	88,635	86,399	[2] 1,674,888	[2] 1,773,132
District 2:								
Illinois	366,365	390,956	7,646	5,974	1,872	2,467	375,883	399,397
Indiana	240,507	269,110	1,844	3,236	869	495	243,220	272,841
Iowa	206,970	227,586	119	191	69	75	207,158	227,852
Kansas	211,185	225,061	15,641	15,801	18,209	18,605	245,035	259,467
Kentucky	83,538	101,025	157	213	2,071	1,590	85,766	102,828
Michigan	121,506	152,159	272	180	24	232	121,802	155,571
Minnesota	189,197	210,542	5,583	4,847	333	190	195,113	215,579
Missouri	284,847	327,247	3,298	3,404	5,220	6,146	293,365	336,797
Nebraska	122,054	152,367	1,041	828	938	646	124,033	153,841
North Dakota	48,741	52,866	2,808	2,856	2,211	4,862	53,760	60,584
Ohio	148,497	157,315	502				148,999	157,315
Oklahoma	219,880	254,348	22,387	22,797	56,582	56,051	298,849	333,196
South Dakota	61,986	63,770	10	178	1,086	1,620	63,082	65,568
Tennessee	56,014	66,927	426	514	4,663	5,065	61,103	72,506
Wisconsin	185,944	212,328	8,026	9,960	336	277	194,306	222,565
Total [1]	2,649,546	3,040,402	172,651	169,384	103,983	114,775	[3] 3,180,290	[3] 3,579,264
District 3:								
Alabama	97,928	107,203	3,382	2,836	30,372	35,011	131,682	145,050
Arkansas	159,614	150,585	8,466	8,570	53,509	55,736	221,589	214,891
Louisiana	62,401	69,572	10,610	9,443	80,436	79,774	153,447	158,789
Mississippi	106,697	125,154	7,510	7,399	72,586	68,375	186,793	200,928
New Mexico	85,088	85,264	3,572	2,727	13,505	13,183	102,165	101,174
Texas	369,788	429,959	60,706	54,328	465,888	443,002	896,382	927,289
Total [1]	1,933,377	2,065,942	1,152,173	1,140,092	798,647	767,003	[4] 4,955,146	[5] 5,236,923
District 4:								
Colorado	114,825	113,521	1,407	693	3,505	3,650	119,737	117,864
Idaho	22,079	22,362				5	22,079	22,367
Montana	31,862	29,206	1,043	1,055	1,505	1,744	34,410	32,005
Utah	20,639	21,485	35	12	791	337	21,465	21,834
Wyoming	35,777	33,557	231	138	7,152	4,635	43,160	38,330
Total [1]	237,625	233,487	10,748	10,841	15,913	15,407	[2] 264,286	[2] 259,735
District 5:								
Alaska	2,346	3,311					2,346	3,311
Arizona	35,057	37,864		326	6,056	4,103	41,113	42,293
California	255,661	277,574			53,681	56,016	309,342	333,590
Hawaii	22	4,927			7,193	4,783	7,215	9,710
Nevada	34,634	37,421			69	83	34,703	37,504
Oregon	33,766	34,272				1,697	33,766	35,969
Washington	38,660	40,137			397	2,262	39,057	42,399
Total [1]	500,504	530,388	32,562	50,423	70,105	71,004	[2] 654,784	[2] 721,224
Total United States shipments	6,474,558	7,120,976	1,443,081	1,439,891	1,077,283	1,054,588	10,729,394	11,570,278

[1] District totals do not equal the sum of State totals due to the inclusion in District totals and the exclusion in State totals of figures for refinery fuel, chemical, synthetic rubber and secondary recovery uses to avoid disclosing company data. Data for these uses are shown in Table 16.

[2] Includes ethane, isobutane, and all other mixtures, See Table 16.

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TABLE 16.—Consumption of liquefied petroleum gases and ethane for chemical, synthetic rubber, refinery fuel, and secondary recovery of petroleum uses, by type, by PAD district [1]

(Thousand gallons)

Use and PAD District	Ethane		Propane		Butane		Isobutane		Butane-propane mixture		All other mixtures		Total	
	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963	1962	1963
Chemical:														
District 1	340,726	347,106	55,511	35,943	59,437	59,783	590	1,057	21	125	16,484	18,662	472,769	462,676
District 2	237,846	237,122	39,341	49,017	56,439	44,521	5,362	2,533	508	338	10,902	15,048	350,398	348,579
District 3	630,342	783,173	1,016,726	1,035,821	549,562	543,269	35,129	30,528	73,565	65,934	342,857	369,531	2,648,181	2,828,256
District 4														
District 5	11,012	10,694	42,724	50,498	5,654	11,969		146		26	40,601	58,569	99,991	131,902
Total	1,219,926	1,378,095	1,154,302	1,171,279	671,092	659,542	41,081	34,264	74,094	66,423	410,844	461,810	3,571,339	3,771,413
Synthetic rubber:														
District 1														
District 2														
District 3	2,689	189			492,738	492,904	201		6,956		59,731	80,465	562,315	573,558
District 4														
District 5					25,064	25,998							25,064	25,998
Total	2,689	189			517,802	518,902	201		6,956		59,731	80,465	587,379	599,556
Refinery fuel:														
District 1			9,000	3,428	5,962	3,300			1,166	1,000			16,128	7,728
District 2			60,432	127,778	45,572	53,894			8,992	16,116			114,996	197,778
District 3			34,126	57,506	15,620	18,616			1,830	5,988			51,576	82,110
District 4			4,676	6,486	7,316	8,344			2,960	5,036			14,952	19,866
District 5			29,293	37,292	1,844	12,130			2,295	54			33,432	49,476
Total		*	137,527	232,490	76,314	96,274			17,243	28,194			231,084	356,958

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Secondary recovery of petroleum:														
District 1														
District 2			2,542		880								3,422	
District 3			1,009	4,878	7								1,016	4,878
District 4			7,767	6,770	716	599							8,483	7,369
District 5			28,341	7,092					414	1,980			28,755	9,072
Total			39,659	18,740	1,603	599			414	1,980			41,676	21,319
Total:														
District 1	340,726	347,106	64,511	39,371	65,399	63,083	590	1,057	1,187	1,125	16,484	18,662	488,897	470,404
District 2	237,846	237,122	102,315	176,795	102,891	98,405	5,362	2,533	9,500	16,454	10,902	15,048	468,816	546,357
District 3	633,031	783,362	1,051,861	1,098,205	1,057,927	1,054,789	35,330	30,528	82,351	71,922	402,588	449,996	3,263,088	3,488,802
District 4			12,443	13,256	8,032	8,943			2,960	5,036			23,435	27,235
District 5	11,012	10,694	100,358	94,882	32,562	50,097		146	2,709	2,060	40,601	58,569	187,242	216,448
Total United States	1,222,615	1,378,284	1,331,488	1,422,509	1,266,811	1,275,317	41,282	34,264	98,707	96,597	470,575	542,275	4,431,478	4,749,246

[1] State figures not shown to avoid disclosure of individual company data.

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FOREIGN TRADE

The imports and exports statistics included in this section were compiled by the U.S. Department of Commerce and differ slightly from those used in other sections of this chapter. The Bureau of Mines import data exclude all imports from foreign sources to U.S. territories and possessions from the United States. Exports of liquefied gases totaled 193 million gallons, 30 million more than in 1962. As in past years, Mexico was the principal importer of LPG from the United States, receiving 92 percent of the total exports.

TABLE 17.—LP-gases [1] exported from the United States, by countries

(Thousand gallons [2])

Country	1954–58 (average) [3]	1959	1960	1961	1962	1963
North America:						
Canada	48,440	3,768	5,251	4,134	3,657	6,347
Mexico	88,666	84,965	111,858	121,890	148,931	177,748
Netherlands Antilles	1,346			2	8	13
Bermuda and Caribbean	9,062	4,845	3,791	3,364	2,023	2,481
Central America	1,767	278	456	489	628	438
Other	6					
Total	149,287	93,856	121,356	129,879	155,247	187,027
South America:						
Argentina	230	72	8,818	14,514	3,518	9
Brazil	15,404			454	18	169
Other	274	95	32	34	223	89
Total	15,908	167	3,850	15,002	3,759	267
Europe:						
Denmark	128			24	22	336
France	34		(4)	149	113	2,113
Germany, West	69	132	(4)	528	1,353	1,416
Italy	199	15	21	399	489	436
Netherlands	9	2		133	132	187
Sweden	30		19	(4)	10	10
United Kingdom	43		15	1,566	354	174
Other	22	3		46	106	78
Total	534	152	55	2,845	2,579	4,750
Asia:						
Israel	15	50		9	15	27
Japan	246	164	23	673	374	172
Philippines	146					24
Other	22		2	22	8	32
Total	429	214	25	704	397	255
Africa	136		6	212	325	109
Oceania	105	140	245	410	428	665
Grand total	166,399	94,529	125,537	149,052	162,735	193,073

[1] Data include LP-gases.
[2] 4.5 pounds = 1 gallon.
[3] Because of changes in classification, data not strictly comparable with other years.
[4] Less than 1,000 gallons.

Source: Bureau of the Census.

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TABLE 18.—Natural gasoline exported from the United States, by countries

(Thousand gallons)

Country	1954–58 (average)	1959	1960	1961	1962	1963
Bahamas						139
Canada	8,123	67	15	61	239	470
Mexico	24	24	38	40	35	60
Turkey				24		
United Kingdom				140		
Other countries	9			80	90	145
Total	8,156	91	53	345	364	814

Source: Bureau of the Census.

TECHNOLOGY

The economics of in-ground storage of liquefied propane gas was advanced in 1963 by the construction of the world's first commercial frozen-earth storage having a capacity of 160,000 barrels of liquid propane. A refrigeration system using the stored product as the refrigerant is used to condense both the boiloff vapor from the pit itself and the vapor generated when the incoming stream is flashed to storage temperature. The pit operates at a slight positive pressure (about 6 inches of water) and at a temperature of minus 56° F. Frozen-earth storage is indicated as being less expensive than refrigerated aboveground storage over a relatively large range of storage volume; however, the difference is not great and a concise study of fill rate, incoming product temperature, land, labor, utility costs, and surface and subsurface geology is necessary to make comparable evaluations.

Currently the economic and other advantages of refrigerated storage of LPG in above-ground metallic containers are being carefully considered. With given design parameters (storage capacity, filling rate and filling temperature) it is possible to find, from a set of minimum-investment curves for storage of commercial propane, the optimum method of storage, and to approximate the initial cost. The design of storage vessels and the materials used in construction, insulation, refrigeration equipment, and safety of refrigerated storage should also be considered.

In the new plants molecular sieves have become the most popular method of treating propane and butane containing hydrogen sulfide and mercaptans. From 45 to 50 light hydrocarbon-liquid sweeteners are currently in operation and in two-thirds of them molecular sieves were substituted for the desiccant in the existing propane dehydrator. Propane passes down through the packed sieve bed to provide an outlet product free of water, hydrogen sulfide, and mercaptans. Normally this bed will stay on stream for 8 hours and is desorbed while another bed is brought into operation.

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The increasing gas production has resulted in corresponding increases in gas-liquids production and construction of new gas processing plants, and this trend is expected to continue within the next few years. In South Louisiana, refrigerator oil-absorption plants have almost doubled the 1961 capacity of three billion cubic feet per day. Refrigeration range for the small plants is from 0° to minus 25° and minus 20° to minus 40° F for the larger plants. Plant units are automatic, skid-mounted, and can easily be transported to another location. Average capacity of short-cycle units is 49 million cubic feet per day, with an average liquids recovery of 3,460 gallons per day. South Louisiana is also the fastest growing area utilizing centralized fractionators that are located close to underground storage and transportation areas for natural-gas liquids.

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Crude Petroleum and Petroleum Products

By James G. Kirby,[1] and Betty M. Moore[2]

CONTENTS

	Page
General summary	389
Demand by products	390
Scope of report	394
Districts	395
World oil supply	397
Reserves	398
Crude petroleum	398
Supply and demand	398
Production	399
General	399
By States	399
Wells	410
Consumption and distribution	422
Stocks	432
Storage capacity	437
Value and price	442
Refined products	444
General review	444
Refinery capacity	454
Refined products—Continued	
Aviation gasoline	454
Gasoline	457
Kerosine	472
Distillate fuel oil	475
Residual fuel oil	481
Lubricants	486
Jet fuel (military grade)	489
Liquified gases (including ethane)	491
Asphalt and road oil	493
Other products	502
Intercoastal shipments	508
Foreign trade	510
Native asphalt	521
Bituminous limestone and sandstone	521
Gilsonite	521
Water usage in the petroleum and natural gas industries	521

GENERAL SUMMARY

THE TOTAL demand[3] for all oils in 1963 was 10,768,000 barrels daily, an increase of 3.5 percent over the 1962 daily average of 10,403,000. Domestic demand increased 3.2 percent to 10,560,000 barrels daily. Exports reversed the downward trend of the past several years and increased 23.8 percent. This was the result of exceptionally cold weather in Europe during the first quarter of the year. Large shipments of distillate and residual fuel oils were shipped abroad to relieve the fuel shortage. The total new supply of all oils in 1963 was 10,771,000 barrels daily. Domestic crude oil production, 7,542,000 barrels daily, represented 70.0 percent of the supply; natural gas liquids production, 10.2 percent; and imports of crude oil and refined products, 19.8 percent.

[1] Industry economist, Division of Petroleum.
[2] Statistical assistant, Division of Statistics.
[3] Certain terms as used in this chapter are more or less unique to the petroleum industry. Principal terms and their meaning are:
Total demand.—A derived figure representing total new supply plus decreases or minus increases in reported stocks. Because there are substantial secondary and consumers' stocks that are not reported to the Bureau of Mines, this figure varies considerably from consumption.
Domestic demand.—Total demand less exports.
New supply of all oils.—The sum of crude oil production plus production of natural gas liquids, plus benzol (coke-oven) used for motor fuel, plus imports of crude oil and other petroleum products.
Transfers.—Crude oil conveyed to fuel-oil stocks without processing, or reclassification of products from one product category to another.
All oils.—Crude petroleum, natural gas liquids, and their derivatives.
Principal product.—Gasoline, kerosine, distillate fuel, and residual fuel oil.

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TABLE 1.—Salient statistics of crude petroleum, refined products, and natural gas liquids in the United States

	1959	1960	1961	1962	1963 [1]
Crude petroleum:					
Domestic production....thousand barrels [2]	2,574,590	2,574,933	2,621,758	2,676,189	2,752,723
World production....do....	7,144,860	7,689,851	8,183,863	8,882,218	9,535,434
U.S. proportion....percent..	36	33	32	30	29
Imports [3]....thousand barrels [2]..	352,344	371,575	381,548	411,039	412,660
Exports [4]....do....	2,526	3,087	3,227	1,790	1,737
Stocks, end of year....do....	257,129	239,800	244,664	252,011	237,361
Runs to stills....do....	2,917,661	2,952,534	2,987,158	3,069,631	3,170,652
Value of domestic production at wells:					
Total....thousand dollars..	7,473,336	7,420,181	7,565,582	7,774,051	7,966,651
Average per barrel....	$2.90	$2.88	$2.89	$2.90	$2.89
Total producing oil wells Dec. 31....	583,141	591,158	594,917	596,385	595,462
Total oil wells completed during year (successful wells)....	27,055	22,492	21,850	21,372	20,288
Refined products:					
Imports [5]....thousand barrels [2]..	297,239	292,536	318,118	348,754	364,922
Exports [4]....do....	74,541	70,819	60,336	59,600	74,048
Stocks, end of year....do....	526,954	515,827	543,343	[6] 550,900	564,451
Output of gasoline [7]....do....	1,488,860	1,522,497	1,534,462	1,583,376	1,627,975
Yield of gasoline....percent..	44.9	45.1	44.7	44.8	44.1
Average dealers' net price (excluding tax) of gasoline in 55 U.S. cities..cents per gallon [8]..	16.09	16.08	15.80	15.45	15.22
Completed refineries, end of year....	310	311	311	308	304
Daily crude-oil capacity thousand barrels [2]..	9,901	10,010	10,105	10,118	10,385
Natural gas liquids:					
Production....do....	320,757	340,157	361,689	372,705	401,116
Stocks, end of year....do....	24,887	28,931	37,067	31,385	33,747

[1] Preliminary figures.
[2] 42 gallons per barrel.
[3] Bureau of Mines data for crude oil and unfinished oils.
[4] U.S. Department of Commerce data, except those for Hawaii (before 1960) which are Bureau of Mines data. Exports include shipments to territories.
[5] U.S. Department of Commerce data, except for unfinished oils.
[6] New basis. These data are comparable to 1963 due to product reclassification resulting from separately reporting data for petrochemical feedstocks.
[7] Beginning with 1961 excludes unfinished gasoline.
[8] Platt's Oil Price Handbook.

DEMAND BY PRODUCTS

As most of the indicated consumption of crude oil in the United States is converted into products at refineries, before sale to ultimate consumers, the analysis of demand trends involves consideration of each major product. The fuel oils (residual, distillate, and kerosine) compete directly with natural gas or coal in heating, cooking, and industrial uses. Gasoline and diesel fuel are the major fuels used in the transportation field, followed by jet fuel (a blend of low-grade gasoline, kerosine, and distillate) used in military jetplanes, and straight kerosine which is used as fuel by commercial jetplanes. The other products serve a wide variety of uses in competition with other refined products as fuel and in special uses that are not fuels.

Beginning with the 1963 data, petrochemical feed stocks produced at refineries are being reported as a separate product. This eliminates products used for chemical manufacture from the other petroleum products. For this reason demands by individual products for 1963 and previous years are not strictly comparable.

Gasoline.—The total demand for gasoline, which includes motor gasoline, aviation gasoline, and naphthas, was 1,641,866,000 barrels in 1963 compared with 1,591,283,000 barrels in 1962. Domestic demand was 1,634,927,000 barrels, an increase for the year of 3.2

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percent, and exports totaled 6,939,000 barrels, a gain of 5.3 percent. The demand for aviation gasoline continued to decline and for the year was 54,800,000 barrels, 1,882,000 barrels less than in 1962. A breakdown of domestic demand by uses indicates that civilian highways consumed 89.2 percent; aviation gasoline, 3.1 percent; and nonhighway vehicles, nonfuel use, and losses, 7.7 percent.

Distillate Fuel Oil.—The total demand for distillate fuel oil in 1963 was 762,193,000 barrels, a gain of 2.9 percent. This included a domestic demand of 747,221,000 barrels and exports of 14,972,000 barrels. Demand in the third quarter was exceptionally high, exceeding the year-ago level by 11.0 percent.

The increase of 2.7 percent in demand for the first quarter over the same quarter of 1962 was due to colder weather and increased exports to Europe to relieve fuel shortages there. Cause of the 11.0-percent increase which occurred in the third quarter is not so clear. It can only be assumed that stocks of distillate moved from primary to secondary storage facilities, thus inflating demand in the third quarter and reducing the demand for the fourth quarter.

Residual Fuel Oil.—The demand for residual fuel oil continued to decline in 1963. Domestic demand was down 4.4 million barrels for the year; however, exports increased 2.4 million barrels so that total demand was only 2.0 million barrels less than in 1962.

Kerosine.—Commercial jet aircraft use of kerosine as fuel continued to increase in 1963 and accounted for 75,473,000 barrels or almost 44 percent of the total. "Other uses" for kerosine declined 1 percent for the year.

Other Products.—The total demand for all other products, including crude oil exports and losses (73,620,000 barrels), was 796,773,000 barrels. An actual comparison of 1962 and 1963 individual product demands is not possible because petrochemical feedstocks produced at petroleum refineries is treated as a separate product in 1963. The 1963 demand for petrochemical feedstocks was 91,756,000 barrels, of which 7,834,000 barrels was produced from still gas, 39,276,000 barrels from liquefied refinery gas, 22,022,000 barrels from naphtha, and 22,624,000 barrels from the other products which are principally miscellaneous finished products but which also include kerosine, distillate fuel oils, and residual fuel oil. The total demand for military-grade jet fuel increased 3.8 percent in 1963, asphalt demand increased 2.7 percent, petroleum coke, 2.4 percent, and lubricating oils, 1.0 percent. Demand for wax and road oil declined 2.4 percent and 0.7 percent, respectively.

Shipments to U.S. Territories and Possessions.—Domestic demand, as defined in this chapter, refers to demand in all States of the United States. Shipments from the United States to territories and possessions are included with exports. Any foreign receipts into these territories and possessions are not included in the total imports shown.

Shipments from territories and possessions to foreign countries are excluded from total exports. Shipments to the United States are included in imports.

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TABLE 2.—Supply and demand of all oils in the United States, 1961 total and 1962–63, by months

(Thousand barrels)

	1962													1961 total
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
New supply:														
Domestic production:														
Crude petroleum	227,756	209,072	228,661	221,737	222,969	217,712	224,018	224,240	219,589	228,380	223,231	228,824	2,676,189	2,621,758
Natural gas liquids	31,990	29,305	32,105	30,469	30,510	29,263	31,112	30,577	30,345	31,604	32,024	33,401	372,705	361,689
Benzol, etc	9	5	4	10	6	4	3	4	10	12	13	11	91	169
Total production	259,755	238,382	260,770	252,216	253,485	246,979	255,133	254,821	249,944	259,996	255,268	262,236	3,048,985	2,983,616
Imports: [1]														
Crude petroleum	36,349	31,603	31,761	32,249	34,181	33,817	35,936	40,293	34,407	35,828	33,266	31,349	411,039	381,548
Refined products	40,286	28,624	33,112	26,895	25,314	24,742	23,455	24,318	27,575	26,902	30,520	37,011	348,754	318,118
Total new supply	336,390	298,609	325,643	311,360	312,980	305,538	314,524	319,432	311,926	322,726	319,054	330,596	3,808,778	3,683,282
Increase (+) or decrease (−) in stocks	−37,083	−13,125	−10,786	+19,784	+14,581	+14,067	+17,550	+17,337	+21,105	+10,997	−15,930	−26,702	+11,795	+40,516
Demand:														
Total demand	373,473	311,734	336,429	291,576	298,399	291,471	296,974	302,095	290,821	311,729	334,984	357,298	3,796,983	3,642,766
Exports: [2]														
Crude petroleum	99	141	208	87	340	42	190	184	91	3	260	145	1,790	3,227
Refined products	4,693	4,943	4,750	5,119	5,268	4,692	4,987	5,195	5,579	4,003	4,822	5,549	59,600	60,336
Domestic demand:														
Gasoline	121,535	109,302	130,386	129,439	140,696	140,605	142,704	147,366	126,560	136,923	133,322	125,853	1,584,691	1,533,173
Kerosine	21,227	16,030	15,043	10,645	8,960	9,216	10,895	10,633	12,052	13,574	16,161	19,731	164,167	144,435
Distillate fuel oil	101,234	82,434	75,564	53,716	44,607	40,031	40,763	36,560	44,393	51,329	71,962	89,812	732,405	694,356
Residual fuel oil	64,678	50,096	54,870	40,455	38,894	34,548	34,133	34,827	39,213	43,232	51,319	58,643	545,813	548,678
Military jet fuel	9,495	7,259	9,636	8,942	10,034	10,415	8,733	10,118	11,592	8,928	8,393	8,856	112,401	104,436
Lubricants	3,494	3,528	3,563	3,808	3,981	3,752	3,644	3,828	3,471	3,904	3,624	3,018	43,615	41,534
Wax	368	388	404	313	368	319	248	324	302	364	315	252	3,965	4,390
Coke	6,148	5,284	6,122	5,520	6,065	6,107	5,746	6,468	5,655	6,209	5,569	5,811	70,704	67,134
Asphalt	3,432	3,616	4,768	6,902	11,294	13,836	14,858	17,167	13,301	13,290	7,843	3,815	114,122	107,753
Road oil	78	48	249	351	648	1,029	1,416	1,416	742	568	257	163	6,965	5,802
Still gas	10,523	9,523	10,771	10,261	11,321	11,542	11,985	11,598	11,060	11,117	10,293	10,335	130,829	127,537
Liquefied gases	29,631	20,813	22,773	18,483	17,783	17,577	19,024	18,416	19,570	20,841	22,879	27,672	255,462	233,908
Miscellaneous	2,241	2,396	2,248	2,547	2,795	2,689	2,637	2,732	2,551	2,680	2,930	2,454	30,890	28,144
Total domestic product demand	374,084	311,617	336,397	291,382	297,436	291,666	296,791	301,453	290,462	312,959	334,867	356,915	3,796,029	3,641,280
Crude losses	309	275	284	291	286	289	294	293	283	286	281	294	3,465	3,352
Less net processing gain	5,712	5,242	5,210	5,303	4,931	5,218	5,288	5,030	5,594	5,522	5,246	5,605	63,901	65,429
Total domestic demand	368,681	306,650	331,471	286,370	292,791	286,737	291,797	296,716	285,151	307,723	329,902	351,604	3,735,593	3,579,203
Stocks:														
Crude petroleum	242,444	240,166	245,632	255,859	255,676	247,740	242,418	243,588	244,226	251,719	256,284	252,011	252,011	244,664
Natural gas liquids	29,859	30,019	30,233	32,817	35,326	37,323	39,093	40,284	40,393	39,331	36,677	31,385	31,385	37,067
Refined products	515,688	504,681	488,215	495,188	507,443	527,449	548,551	563,527	583,885	588,451	570,610	553,473	553,473	543,343
Total stocks	787,991	774,866	764,080	783,864	798,445	812,512	830,062	847,399	868,504	879,501	863,571	836,869	836,869	825,074

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	1963 [3]												1962 total
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
New supply:														
Domestic production:														
Crude petroleum	226,420	212,437	234,289	228,270	234,499	226,853	235,144	236,830	225,207	233,610	226,321	232,843	2,752,723	2,676,189
Natural-gas liquids	33,535	32,141	34,413	31,948	33,082	31,939	33,278	34,039	32,794	34,113	34,288	35,546	401,116	372,705
Benzol, etc	7	6	7	10	7	6	7	7	6	7	5	5	80	91
Total production	259,962	244,584	268,709	260,228	267,588	258,798	268,429	270,876	258,007	267,730	260,614	268,394	3,153,919	3,048,985
Imports: [1]														
Crude petroleum	41,043	30,898	36,070	32,593	34,484	31,872	38,214	36,666	34,898	31,362	34,241	30,319	412,660	411,039
Refined products	43,051	35,544	29,809	32,491	27,052	22,253	27,029	25,529	23,894	32,660	27,608	38,002	364,922	348,754
Total new supply	344,056	311,026	334,588	325,312	329,124	312,923	333,672	333,071	316,799	331,752	322,463	336,715	3,931,501	3,808,778
Increase (+) or decrease (−) in stocks	−41,353	−33,419	+11,478	+24,525	+18,120	+19,735	+19,285	+12,272	+10,958	+11,701	+2,855	−54,894	+1,263	+11,795
Demand:														
Total demand	385,409	344,445	323,110	300,787	311,004	293,188	314,387	320,799	305,841	320,051	319,608	391,609	3,930,238	3,796,983
Exports: [2]														
Crude petroleum	185	122	95	170	153	123	152	186	100	179	106	166	1,737	1,790
Refined products	4,113	8,151	5,536	6,563	6,154	5,426	5,889	6,353	7,040	6,022	6,485	6,316	74,048	59,600
Domestic demand:														
Gasoline	124,380	115,338	128,338	138,181	143,317	140,661	149,996	151,105	133,992	142,043	132,882	134,694	1,634,927	1,584,691
Kerosine	22,552	18,993	14,199	10,121	10,197	9,824	10,874	12,360	13,326	12,474	15,404	21,902	172,226	164,167
Distillate fuel oil	103,222	88,394	71,911	48,918	48,248	39,665	40,292	42,970	50,457	49,509	61,452	102,183	747,221	732,405
Residual fuel oil	64,984	57,709	49,329	43,397	37,036	35,007	36,223	36,070	35,646	41,801	43,789	60,350	541,341	545,813
Military jet fuel	9,775	8,404	7,670	9,531	10,884	8,673	10,844	11,845	10,170	10,945	9,052	8,788	116,581	112,401
Lubricants	3,768	3,057	3,373	3,814	4,100	3,807	3,733	3,959	3,438	4,316	3,325	2,887	43,577	43,615
Wax	330	293	364	324	316	297	315	308	320	338	283	322	3,810	3,965
Coke	6,266	5,283	5,996	5,592	5,753	5,751	5,976	5,655	5,566	5,728	5,145	6,553	69,264	70,704
Asphalt	3,361	2,821	4,397	5,912	14,412	13,808	16,532	16,219	14,617	14,207	6,907	4,094	117,287	114,122
Road oil	120	126	158	366	595	1,072	1,534	1,262	812	529	203	137	6,914	6,965
Still gas	10,216	9,591	10,527	10,368	11,020	11,376	12,015	11,690	10,821	10,561	10,512	10,821	129,518	130,829
Liquefied gases	28,383	23,454	18,240	15,385	15,122	14,811	17,042	17,236	16,092	17,586	20,889	29,518	233,758	255,462
Petrochemical feedstocks [4]	6,578	6,143	7,723	6,781	7,718	7,871	7,891	8,174	7,727	8,379	7,961	8,810	91,756	----------
Miscellaneous	1,174	1,557	1,400	1,222	1,427	1,327	1,364	1,427	1,479	1,517	1,295	1,172	16,361	30,890
Total domestic product demand	385,109	341,163	323,625	299,912	310,145	293,950	314,631	320,280	304,463	319,933	319,099	392,231	3,924,541	3,796,029
Crude losses	299	281	299	280	294	295	303	304	290	297	291	299	3,532	3,465
Less net processing gain	4,297	5,272	6,445	6,138	5,742	6,606	6,588	6,324	6,052	6,380	6,373	7,403	73,620	63,901
Total domestic demand	381,111	336,172	317,479	294,054	304,697	287,639	308,346	314,260	298,701	313,850	313,017	385,127	3,854,453	3,735,593
Stocks:														
Crude petroleum	249,209	240,396	241,029	251,391	255,666	250,036	249,962	249,077	248,261	245,539	244,387	237,361	237,361	252,011
Natural gas liquids	23,970	20,867	23,928	27,160	31,622	35,403	38,769	41,384	43,078	43,750	42,084	33,747	33,747	31,385
Refined products	519,764	498,261	506,045	516,976	526,359	547,943	563,936	574,478	584,558	598,309	603,982	564,451	564,451	[5] 550,900
Total stocks	792,943	759,524	771,002	795,527	813,647	833,382	852,667	864,939	875,897	887,598	890,453	835,559	835,559	[5] 834,296

[1] Bureau of Mines data for crude oil and unfinished oils, U.S. Department of Commerce data for all imports.
[2] U.S. Department of Commerce data.
[3] Preliminary figures.
[4] Produced at petroleum refineries.
[5] New basis. These data are comparable to 1963 due to product reclassification resulting from separately reporting data for petrochemical feedstocks.

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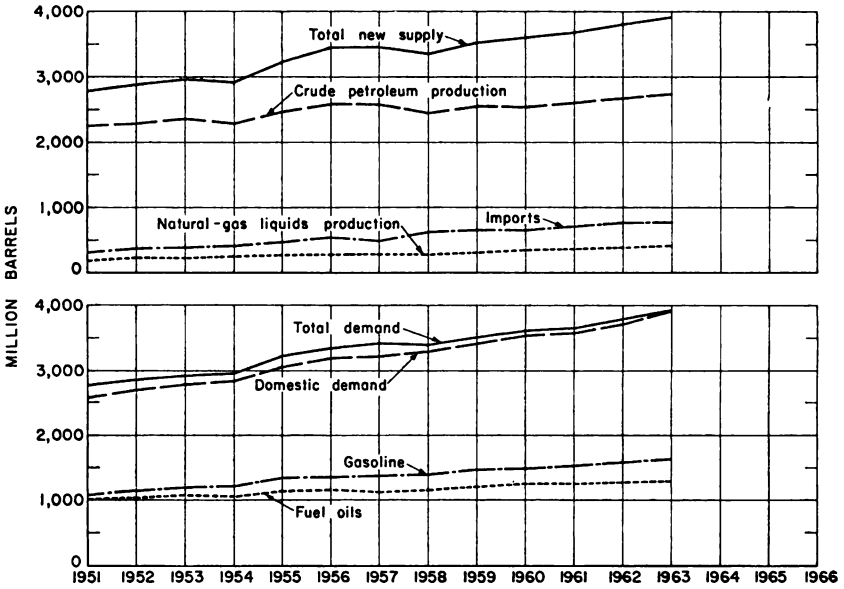

FIGURE 1.—Supply and demand of all oils in the United States, 1951–63.

TABLE 3.—Demand for all oils [1] in the United States

(Million barrels)

Year	Domestic demand	Exports	Total demand	Year	Domestic demand	Exports	Total demand
1954	2,832.4	129.7	2,962.1	1959	3,449.6	77.1	3,526.7
1955	3,087.8	134.2	3,222.0	1960	3,535.8	73.9	3,609.7
1956	3,213.2	157.4	3,370.6	1961	3,579.2	63.6	3,642.8
1957	3,218.6	207.2	3,425.8	1962	3,735.6	61.4	3,797.0
1958	3,315.2	100.6	3,415.8	1963 [2]	3,854.4	75.8	3,930.2

[1] See text footnote 4 at the beginning of this chapter.
[2] Preliminary figures.

SCOPE OF REPORT

This report deals primarily with statistics for production, refining, distribution, and indicated consumption of crude petroleum and refined products in the United States. The object of limiting data to the United States is to permit a breakdown and balancing of supply and demand of operations by States and districts. The composition of the districts used by the Bureau of Mines is explained in the next section.

The increasing volume of natural gas liquids recovered from natural gas has made it necessary to present data on these liquids with the crude oil data, as they are either blended with refinery

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products or are identical with materials recovered from refinery gases. These natural gas liquids are recovered at special plants away from the oil refineries.

Most of the data were compiled by the Bureau of Mines from detailed reports, submitted on a voluntary basis by the various companies. These data are published monthly for release about 8 weeks after the end of the month concerned. Complete coverage, with only minor estimates, is procured for production, stocks, and refinery operations. The Bureau of Mines used the import data as reported by the refineries for crude oil and unfinished oils. Other product imports and all export data were taken from records of the U.S. Department of Commerce.

The Bureau of Mines uses crude-oil production data compiled by State agencies for those States which compile the information. Where such data are not available, the Bureau of Mines sends monthly questionaires to all pipeline companies operating within the State. Monthly reports are received from refineries showing crude oil receipts by States of origin and method of transportation. These reports include information covering final receipts by water, tankcars, and trucks and cover stocks of crude oil, held at refineries, by States of origin. The Bureau of Mines crude production figure includes field condensate.

Individual refineries reported monthly receipts, input, stocks at the beginning and end of the month, refinery production, and deliveries. Data on both product stocks at refineries and pipeline and bulk terminal stocks are collected.

Semiannual canvasses of refineries, pipeline companies, and natural gas liquids plants provide data on storage tank capacities assigned to the various refined products and to liquefied gases at plants, terminals, and underground storage facilities.

Annual canvasses provide supplemental information on the value of crude petroleum at wells, the number of producing oil wells, sales of fuel oils, asphalt and road oils by uses, and refinery capacity.

The table showing world production of crude oil by countries is based on monthly reports that also included data on crude movements and refinery operations. Data on crude reserves, wells drilled, and current prices were taken from the sources indicated in the footnotes.

DISTRICTS

The Bureau of Mines reported production of crude petroleum and natural gas liquids and the number of wells drilled by States. Louisiana, New Mexico, and Texas were also reported by districts.

New Mexico has two widely separated producing areas. The Southeastern district comprises mainly Lea, Eddy, Chaves, and Roosevelt Counties. The Northwestern district comprises mainly San Juan, Rio Arriba, Sandoval, and McKinley Counties.

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The Bureau of Mines producing districts in Texas correspond, with one exception, to grouping of the Texas Railroad commission districts.

Bureau of Mines districts:	*Railroad Commission district*
Gulf Coast	Nos. 2 and 3.
West Texas	Nos. 7C and 8.
East Proper	Part of No. 6 (East Texas field in Cherokee, Smith, Upshur, Rush, and Gregg Counties).
Panhandle	No. 10.
Rest of State:	
North	Nos. 7B and 9.
Central	No. 1.
South	No. 4.
Other East Texas	Nos. 5 and 6 (exclusive of East Proper).

The Bureau of Mines groups refinery operations into another set of districts called refining districts. These refining districts correspond with the grouping originated by the Petroleum Administration for War during World War II and called PAW districts (later changed to PAD districts).

PAD district:	*Refining district*
1	*East Coast*—District of Columbia and Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, Georgia, and Florida, and the following counties of New York: Cayuga, Tompkins, Chemung, and all counties east and north thereof, and the following counties of Pennsylvania: Bradford, Sullivan, Columbia, Montour, Northumberland, Dauphin, York, and all counties east thereof.
1	*Appalachian No. 1*—West Virginia and those parts of Pennsylvania and New York not included in the East Coast district.
2	*Appalachian No. 2*—The following counties of Ohio: Erie, Huron, Crawford, Marion, Delaware, Franklin, Pickaway, Ross, Pike, Scioto, and all counties east thereof.
2	*Indiana-Illinois-Kentucky*—Indiana, Illinois, Kentucky, Tennesee, Michigan, and that part of Ohio not included in the Appalachian district.
2	*Oklahoma-Kansas-Missouri*—Oklahoma, Kansas, Missouri, Nebraska, and Iowa.
2	*Minnesota-Wisconsin-North Dakota-South Dakota*—Minnesota, Wisconsin, North Dakota, and South Dakota.
3	*Texas Inland*—Texas, except Texas Gulf Coast district.
3	*Texas Gulf Coast*—The following counties of Texas: Newton, Orange, Jefferson, Jasper, Tyler, Hardin, Liberty, Chambers, Polk, San Jacinto, Montgomery, Harris, Galveston, Waller, Fort Bend, Brazoria, Wharton, Matagorda, Jackson, Victoria, Calhoun, Refugio, Aransas, San Patricio, Nueces, Kleberg, Kenedy, Willacy, and Cameron.
3	*Louisiana Gulf Coast*—The following parishes of Louisiana: Vernon, Rapides, Avoyelles, Pointe Coupee, West Feliciana, East Feliciana, Tangipahoa, St. Helena, Washington, and all parishes south thereof; the following counties of Mississippi: Pearl River, Stone, George, Hancock, Harrison, and Jackson; and Mobile and Baldwin Counties, Ala.
3	*North Louisiana-Arkansas*—Arkansas and those parts of Louisiana, Mississippi, and Alabama not included in the Louisiana Gulf Coast district.
3	*New Mexico*—New Mexico.
4	*Rocky Mountain*—Montana, Idaho, Wyoming, Utah, and Colorado.
5	*West Coast*—Washington, Oregon, California, Nevada, Alaska, Arizona, and Hawaii.

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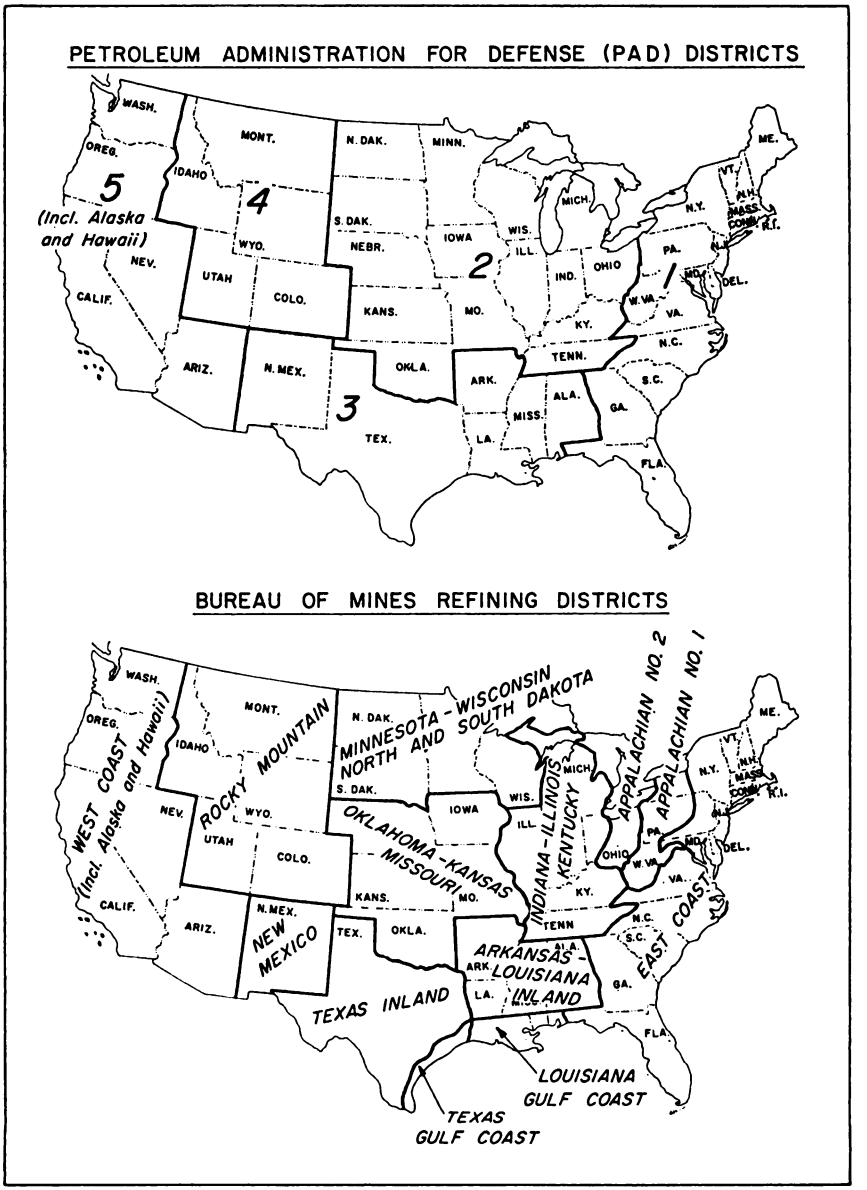

FIGURE 2.—Map of PAD districts and Bureau of Mines refining districts.

WORLD OIL SUPPLY

Crude oil production for the world in 1963 was 9,535 million barrels compared with 8,882 million barrels in 1962. U.S. production represented 28.9 percent of the world total, less than in 1962.

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RESERVES

The American Petroleum Institute Committee on Petroleum Reserves estimated proved reserves of crude oil in the United States to be 30,969,990,000 barrels on December 31, 1963, a decline of 419,233,000 barrels for the year.

The estimates of crude-oil reserves include only oil recoverable under existing economic and operating conditions.

TABLE 4.—Estimates of proved crude-oil reserves in the United States on Dec. 31, by States[1]

(Million barrels)

State	1956	1957	1958	1959	1960	1961	1962	1963
Eastern States:								
Illinois	700	655	608	594	556	503	460	417
Indiana	68	67	71	74	66	62	61	63
Kentucky	149	138	126	136	129	116	109	100
Michigan	55	49	45	55	78	79	75	69
New York	40	37	36	34	32	28	23	18
Ohio	64	68	71	74	75	76	77	88
Pennsylvania	135	126	120	114	108	102	97	92
West Virginia	51	53	52	51	51	51	56	57
Total	1,262	1,193	1,129	1,132	1,095	1,017	958	904
Central and Southern States:								
Arkansas	318	305	318	313	302	281	247	225
Kansas	992	947	922	917	884	878	862	841
Louisiana[2]	3,675	3,858	4,044	4,660	4,785	4,931	5,087	5,089
Mississippi	368	360	379	389	407	401	388	385
Nebraska	63	63	69	81	86	100	94	84
New Mexico	836	832	894	1,026	1,084	1,090	1,065	1,011
North Dakota	196	258	314	382	431	413	404	389
Oklahoma	2,010	1,941	1,898	1,865	1,791	1,787	1,728	1,628
Texas[3]	14,783	14,555	14,322	14,860	14,758	14,850	14,648	14,573
Total	23,241	23,119	23,160	24,493	24,528	24,731	24,523	24,225
Mountain States:								
Colorado	364	310	392	381	364	420	388	368
Montana	331	320	338	309	267	251	249	271
Utah	61	140	199	195	208	218	198	220
Wyoming	1,363	1,420	1,409	1,403	1,427	1,381	1,297	1,254
Total	2,119	2,190	2,338	2,288	2,266	2,270	2,132	2,113
Pacific Coast States: California[2]	3,771	3,760	3,866	3,763	3,659	3,615	3,648	3,600
Other States[3]	42	38	43	43	65	126	128	128
Total United States	30,435	30,300	30,536	31,719	31,613	31,759	31,389	30,970

[1] From reports of Committee on Petroleum Reserves, American Petroleum Institute. Includes crude oil that may be extracted by present methods from fields completely developed or sufficiently explored to permit reasonably accurate calculations. The change in reserves during any year represents total new discoveries, extensions, and revisions, minus production.

[2] Includes offshore reserves.

[3] Includes Alabama, Arizona, Florida, Missouri, Nevada, South Dakota, Tennessee, Virginia, Washington 1956–60, and Alaska 1959–63.

CRUDE PETROLEUM

SUPPLY AND DEMAND

The new supply of crude petroleum was derived primarily from domestic production, but the supply was augmented by imports. Crude imports represented 13.0 percent of the crude supply in 1963 compared with 13.3 percent in 1962. Under the mandatory import control program, which became effective in March 1959, imports of crude oil, unfinished oils, and refined products other than residual fuel

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oil are limited to a percentage of the estimated total demand for all products in all States east of the Rocky Mountains. In States west of the Rocky Mountains, including Alaska and Hawaii, the import quota is based on the difference between the estimated available domestic supply and the estimated total demand. Overland receipts (imports from Canada and Mexico) are exempted from provisions of the program; however, before setting the allocations for crude and unfinished oils in the States west of the Rocky Mountains, an estimate of probable receipts by pipeline from Canada is subtracted from the difference between domestic supply and the total demand Vessel and aircraft fuels imported inbound for use as fuel outside the United States are also exempted from provisions of the program. All refineries of record are granted an allocation based on their refinery throughput with certain special provisions applying to refineries that imported crude oil during 1957, the base year for the progran.

PRODUCTION

GENERAL

Crude oil production in the United States averaged 7,542,000 barrels daily in 1963 compared with 7,332,000 barrels daily in 1962. The demand for domestic crude oil exceeded production, resulting in a 14 million barrel reduction in stocks of domestic crude oil.

BY STATES

Additional data on production by States will be found in volume III of the Minerals Yearbook.

TABLE 5.—Supply and demand [1] for crude petroleum in the United States

(Thousand barrels)

	1959	1960	1961	1962	1963 [2]
Production	2,574,590	2,574,933	2,621,758	2,676,189	2,752,723
Imports [3]	352,344	371,575	381,548	411,039	412,660
Total new supply	2,926,934	2,946,508	3,003,306	3,087,228	3,165,383
Increase (+) or decrease (−) in stocks, end of year	−5,613	−17,329	+4,864	+7,347	−14,650
Demand:					
Domestic crude	2,578,203	2,592,289	2,614,919	2,669,398	2,767,129
Foreign crude	354,344	371,548	383,523	410,483	412,904
Total demand	2,932,547	2,963,837	2,998,442	3,079,881	3,180,033
Runs to stills:					
Domestic	2,565,504	2,581,568	2,604,127	2,659,826	2,758,168
Foreign	352,157	370,966	383,031	409,805	412,484
Exports [4]	2,526	3,087	3,227	1,790	1,737
Transfers to fuel oil:					
Distillate	970	1,001	851	1,198	807
Residual	7,386	3,948	3,854	3,797	3,305
Other fuel losses	4,004	3,267	3,352	3,465	3,532
Total demand	2,932,547	2,963,837	2,998,442	3,079,881	3,180,033

[1] For definition, see footnote 4 at the beginning of this chapter.
[2] Preliminary figures.
[3] Bureau of Mines data.
[4] U.S. Department of Commerce data.

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TABLE 6.—Supply of and demand for crude petroleum in the United States, by months

(Thousand barrels)

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1962:													
Supply:													
Production	227,756	209,072	228,661	221,737	222,969	217,712	224,018	224,240	219,589	228,380	223,231	228,824	2,676,189
Imports [1]	36,349	31,603	31,761	32,249	34,181	33,817	35,936	40,293	34,407	35,828	33,266	31,349	411,039
Total new supply	264,105	240,675	260,422	253,986	257,150	251,529	259,954	264,533	253,996	264,208	256,497	260,173	3,087,228
Change in stocks, end of period:													
Domestic	−4,805	−3,003	+7,175	+6,313	−964	−6,442	−4,588	−757	+1,765	+6,649	+6,064	−616	+6,791
Foreign	+2,585	+725	−1,709	+3,914	+781	−1,494	−734	+1,927	−1,127	+844	−1,499	−3,657	+556
Demand:													
Domestic	232,561	212,075	221,486	215,424	223,933	224,154	228,606	224,997	217,824	221,731	217,167	229,440	2,669,398
Foreign	33,764	30,878	33,470	28,335	33,400	35,311	36,670	38,366	35,534	34,984	34,765	35,006	410,483
Runs to stills:													
Domestic	231,729	211,230	220,657	214,741	222,917	223,505	227,678	224,329	216,952	221,225	216,289	228,574	2,659,826
Foreign	33,548	30,735	33,331	28,220	33,366	35,277	36,759	38,199	35,711	34,848	34,736	35,075	409,805
Exports [2]	99	141	208	87	340	42	190	184	91	3	260	145	1,790
Transfers:													
Distillate	217	147	173	115	66	69	64	68	73	73	65	68	1,198
Residual	423	425	303	305	358	283	291	290	248	280	301	290	3,797
Losses	309	275	284	291	286	289	294	293	283	286	281	294	3,465
1963: [3]													
Supply:													
Production	226,420	212,437	234,289	228,270	234,499	226,853	235,144	236,830	225,207	233,610	226,321	232,843	2,752,723
Imports [1]	41,043	30,898	36,070	32,593	34,484	31,872	38,214	36,666	34,898	31,362	34,241	30,319	412,660
Total new supply	267,463	243,335	270,359	260,863	268,983	258,725	273,358	273,496	260,105	264,972	260,562	263,162	3,165,383
Change in stocks, end of period:													
Domestic	−6,902	−6,061	−727	+8,580	+4,084	−2,897	−1,554	−2,106	−2,025	−996	−2,349	−1,453	−14,406
Foreign	+4,100	−2,752	+1,360	+1,782	+191	−2,733	+1,480	+1,221	+1,209	−1,726	+1,197	−5,573	−244
Demand:													
Domestic	233,322	218,498	235,016	219,690	230,415	229,750	236,698	238,936	227,232	234,606	228,670	234,296	2,767,129
Foreign	36,943	33,650	34,710	30,811	34,293	34,605	36,734	35,445	33,689	33,088	33,044	35,892	412,904
Runs to stills:													
Domestic	232,556	217,809	234,284	218,924	229,689	228,972	235,973	238,086	226,561	233,903	227,991	233,420	2,758,168
Foreign	36,882	33,613	34,708	30,792	34,247	34,617	36,691	35,446	33,645	32,981	33,010	35,852	412,484
Exports [2]	185	122	95	170	153	123	152	186	100	179	106	166	1,737
Transfers:													
Distillate	77	72	94	66	61	63	62	64	61	61	57	69	807
Residual	266	251	246	269	264	285	251	295	264	273	259	382	3,305
Losses	299	281	299	280	294	295	303	304	290	297	291	299	3,532

[1] Bureau of Mines data. [2] U.S. Department of Commerce. [3] Preliminary figures.

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TABLE 7.—Petroleum produced in the United States, by States [1]

(Thousand barrels unless otherwise stated)

	1959	1960	1961	1962	1963 [2]	1859-1963 total
Production:						
Alabama	5,524	7,329	6,931	7,473	9,175	60,445
Alaska	187	559	6,327	10,259	10,740	28,072
Arkansas	26,329	30,117	29,246	27,649	27,373	1,172,336
California	308,946	305,352	299,609	296,590	300,733	12,924,673
Colorado	46,440	47,469	46,759	42,477	38,271	724,109
Florida	424	369	374	419	464	7,792
Illinois	76,727	77,341	76,818	78,796	73,783	2,457,064
Indiana	11,554	12,054	11,500	12,077	11,417	353,516
Kansas	119,543	113,453	112,241	112,076	109,107	[3] 3,644,939
Kentucky	27,272	21,147	18,344	17,789	19,047	[4] 472,378
Louisiana	362,666	400,832	424,962	477,153	522,739	6,942,986
Michigan	10,439	15,899	18,901	17,114	15,973	[5] 493,547
Mississippi	49,620	51,673	54,688	55,713	58,752	854,713
Montana	29,857	30,240	30,906	31,648	30,875	458,999
Nebraska	22,881	23,825	24,369	24,894	21,775	211,839
Nevada	32	27	154	141	96	695
New Mexico	105,692	107,380	112,553	109,328	109,613	[6] 1,847,747
New York	1,970	1,813	1,658	1,589	1,929	[7] 201,205
North Dakota	17,824	21,992	23,652	25,181	24,957	178,544
Ohio	5,978	5,405	5,639	5,835	6,171	684,883
Oklahoma	198,090	192,913	193,081	202,732	200,238	[3] 8,821,927
Pennsylvania	6,160	6,009	5,643	5,302	4,963	[7] 1,237,396
Texas	971,978	927,479	939,191	943,328	973,097	26,678,918
Utah	39,959	37,594	33,118	31,029	33,471	[8] 217,677
West Virginia	2,184	2,300	2,760	3,470	3,243	475,116
Wyoming	126,050	133,910	141,937	135,847	144,407	2,340,572
Other States [9]	264	452	397	280	314	4,409
Total	2,574,590	2,574,933	2,621,758	2,676,189	2,752,723	73,496,497
Value at wells:						
Total (thousand dollars)	7,473,336	7,420,181	7,565,582	7,774,051	7,966,651	150,344,701
Average per barrel	$2.90	$2.88	$2.89	$2.90	$2.89	$2.05

[1] For detailed figures by States, 1859–1935, see Minerals Yearbook, 1937, p. 1008.
[2] Preliminary figures.
[3] Oklahoma included with Kansas in 1905 and 1906.
[4] Includes Tennessee, 1883–1907.
[5] Figures represent 1925–63 production only; earlier years included with "Other States."
[6] Figures represent 1924–63 production only; earlier years included with "Other States."
[7] Early production in New York included with Pennsylvania.
[8] Figures represent 1946–63 production only; earlier years included with "Other States."
[9] Includes Alaska, 1912–33; Arizona, 1958–63; Arkansas, 1920; Michigan, 1900–1919; Mississippi, 1933–35; Missouri, 1899–1911, 1913–16, 1919–23, 1932–63; New Mexico, 1913, 1919–23; South Dakota, 1955–63; Tennessee, 1916–63; Utah, 1907–11, 1920, 1924–41; Virginia, 1943–63; Washington, 1958–60.

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TABLE 8.—Production of crude petroleum in the United States in 1962–63, by States and months [1]

(Thousand barrels)

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
1962:													
Alabama	689	687	699	608	125	331	408	781	754	806	776	809	7,473
Alaska	809	768	825	848	878	861	883	884	830	890	878	905	10,259
Arkansas	2,340	2,186	2,375	2,303	2,379	2,286	2,332	2,324	2,205	2,341	2,264	2,314	27,649
California [2]	24,813	22,325	24,806	24,176	25,271	24,545	25,283	25,369	24,831	25,362	24,706	25,353	296,590
Colorado [3]	3,698	3,335	3,698	3,554	3,671	3,479	3,563	3,580	3,412	3,538	3,454	3,495	42,477
Florida	39	33	37	36	33	32	34	35	35	36	33	36	419
Illinois	6,566	6,313	6,864	6,627	6,719	6,507	6,598	6,831	6,268	6,747	6,472	6,284	78,796
Indiana	952	902	1,183	1,020	980	1,013	998	1,017	1,028	973	1,038	973	12,077
Kansas [4]	9,035	8,659	9,688	9,320	9,629	9,266	9,458	9,496	9,076	9,774	9,268	9,407	112,076
Kentucky	1,442	1,331	1,449	1,433	1,475	1,434	1,500	1,540	1,457	1,585	1,552	1,591	17,789
Louisiana [5]	39,340	36,385	40,489	39,216	38,944	37,990	39,170	39,385	40,098	41,904	41,209	43,023	477,153
Michigan [6]	1,497	1,349	1,504	1,440	1,468	1,413	1,450	1,442	1,371	1,447	1,371	1,362	17,114
Mississippi	4,418	4,047	4,768	4,462	4,730	4,588	4,863	4,977	4,106	4,978	4,815	4,961	55,713
Montana [7]	2,636	2,423	2,609	2,567	2,672	2,576	2,735	2,713	2,627	2,725	2,609	2,666	31,648
Nebraska	2,106	1,880	2,153	2,100	2,172	2,081	2,145	2,123	2,061	2,072	1,987	2,014	24,894
New Mexico [8]	9,350	8,585	9,622	9,134	9,228	8,734	9,014	8,970	8,787	9,183	9,186	9,535	109,328
New York	131	119	132	131	140	134	156	142	117	138	130	119	1,589
North Dakota [9]	2,231	1,957	2,203	2,066	2,112	2,046	2,173	2,031	1,724	2,149	2,091	2,398	25,181
Ohio	498	440	507	490	525	489	502	514	465	495	487	423	5,835
Oklahoma	17,487	16,255	17,694	16,826	16,793	16,285	16,677	17,190	16,420	17,302	16,727	17,076	202,732
Pennsylvania	454	406	449	478	476	438	444	459	418	465	431	384	5,302
Texas	82,174	75,040	79,629	78,228	79,395	77,612	77,944	78,645	77,844	79,182	78,108	79,527	943,328
Utah [10]	2,812	2,247	2,574	2,346	2,455	2,414	2,523	2,592	2,633	2,812	2,723	2,898	31,029
West Virginia	277	248	311	294	323	310	326	322	269	311	282	197	3,470
Wyoming	11,920	11,114	12,261	12,005	10,342	10,819	12,803	10,846	10,969	11,130	10,598	11,040	135,847
Other States	42	38	42	29	34	29	36	32	34	35	36	34	[11] 421
Total:													
1962	227,756	209,072	228,661	221,737	222,969	217,712	224,018	224,240	219,589	228,380	223,231	228,824	2,676,189
1961	223,497	204,274	231,596	219,846	221,553	213,034	215,999	220,218	209,848	220,942	214,566	226,635	2,621,758
Daily average, 1962	7,347	7,467	7,376	7,391	7,193	7,257	7,226	7,234	7,320	7,367	7,441	7,381	7,332
Pennsylvania grade (included above)	1,044	935	1,078	1,075	1,133	1,068	1,112	1,116	976	1,097	1,012	855	12,491

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1963: [12]													
Alabama	807	748	813	774	702	787	725	768	787	787	736	741	9,175
Alaska	944	813	894	863	892	867	907	896	889	945	903	927	10,740
Arkansas	2,242	2,121	2,325	2,229	2,331	2,237	2,341	2,390	2,295	2,353	2,246	2,263	27,373
California [2]	25,272	22,846	25,520	24,833	25,674	24,932	25,627	25,689	24,876	25,536	24,698	25,230	300,733
Colorado [3]	3,354	3,128	3,398	3,235	3,269	3,190	3,209	3,143	3,022	3,183	2,980	3,160	38,271
Florida	33	32	44	39	42	41	39	40	36	40	39	39	464
Illinois	6,030	5,648	6,443	6,191	6,339	6,184	6,434	6,381	5,970	6,213	6,060	5,890	73,783
Indiana	841	784	1,038	1,064	1,086	968	1,001	1,092	878	951	829	885	11,417
Kansas [4]	8,707	8,765	9,386	9,253	9,163	8,993	9,342	9,239	8,939	9,371	8,890	9,059	109,107
Kentucky	1,492	1,445	1,554	1,625	1,654	1,583	1,693	1,620	1,601	1,661	1,573	1,546	19,047
Louisiana [5]	42,925	39,493	44,385	43,081	44,682	43,317	44,818	45,790	42,019	43,573	43,622	45,034	522,739
Michigan [6]	1,344	1,266	1,348	1,362	1,362	1,321	1,400	1,282	1,297	1,360	1,285	1,346	15,973
Mississippi	4,897	4,572	5,005	4,805	4,975	5,098	4,484	4,964	5,063	5,253	4,736	4,900	58,752
Montana [7]	2,609	2,430	2,666	2,557	2,626	2,516	2,592	2,642	2,544	2,607	2,487	2,599	30,875
Nebraska	1,803	1,742	1,896	1,864	1,887	1,815	1,899	1,863	1,771	1,815	1,707	1,713	21,775
New Mexico [8]	8,942	8,396	9,301	8,917	9,137	8,911	9,217	9,417	9,164	9,462	9,254	9,495	109,613
New York	140	135	143	154	160	148	168	172	169	186	171	183	1,929
North Dakota [9]	2,282	2,129	2,274	2,158	1,978	1,360	2,078	2,220	2,054	2,066	2,092	2,266	24,957
Ohio	413	429	486	486	484	450	482	455	449	467	728	842	6,171
Oklahoma	16,718	15,668	17,399	16,943	17,184	16,544	16,936	16,897	16,066	16,786	16,289	16,788	200,238
Pennsylvania	396	349	383	419	438	407	460	439	426	465	403	378	4,963
Texas	78,754	75,269	81,875	80,018	82,588	80,065	83,583	83,953	80,528	83,594	79,792	83,078	973,097
Utah [10]	2,825	2,655	2,966	2,838	2,887	2,793	2,844	2,839	2,741	2,776	2,685	2,622	33,471
West Virginia	246	257	273	300	303	257	291	277	270	292	250	227	3,243
Wyoming	12,367	11,281	12,442	12,229	12,621	12,036	12,541	12,327	11,296	11,835	11,837	11,595	144,407
Other States	37	36	32	33	35	33	33	35	37	33	29	37	[13] 410
Total:													
1963	226,420	212,437	234,289	228,270	234,499	226,853	235,144	236,830	225,207	233,610	226,321	232,843	2,752,723
1962	227,756	209,072	228,661	221,737	222,969	217,712	224,018	224,240	219,589	228,380	223,231	228,824	2,676,189
Daily average, 1963	7,304	7,587	7,558	7,609	7,565	7,562	7,585	7,640	7,507	7,536	7,544	7,511	7,542
Pennsylvania grade (included above)	968	895	969	1,041	1,076	970	1,082	1,029	1,021	1,090	962	931	12,034

[1] Includes field condensate.
[2] Conservation Committee California Oil Producers.
[3] Colorado Oil and Gas Conservation Commission.
[4] Kansas Geological Survey.
[5] Louisiana Conservation Commission.
[6] Michigan Department of Conservation.
[7] Montana Oil Conservation Board.
[8] New Mexico Oil and Gas Conservation Commission.
[9] North Dakota Geological Survey.
[10] Utah Oil and Gas Conservation Commission.
[11] Includes Arizona (39), Missouri (55), Nevada (141), South Dakota (169), Tennessee (14), and Virginia (3).
[12] Preliminary figures.
[13] Arizona (55), Missouri (54), Nevada (96), South Dakota (187), Tennessee (15), and Virginia (3).

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TABLE 9.—Percentage of total crude petroleum produced in the United States, by States

	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963 [1]
Texas	42.1	42.4	42.3	41.0	38.4	37.8	36.0	35.8	35.2	35.3
Louisiana	10.6	10.9	11.4	12.6	12.8	14.1	15.6	16.2	17.8	19.0
California	15.4	14.3	13.4	13.0	12.8	12.0	11.8	11.4	11.1	10.9
Oklahoma	8.0	8.2	8.2	8.2	8.2	7.7	7.5	7.4	7.6	7.3
Wyoming	4.0	4.0	4.0	4.2	4.7	4.9	5.2	5.4	5.1	5.2
Kansas	5.2	4.9	4.7	4.7	4.9	4.6	4.4	4.3	4.2	4.0
New Mexico	3.2	3.3	3.4	3.6	4.0	4.1	4.2	4.3	4.1	4.0
Illinois	2.9	3.3	3.1	2.9	3.3	3.0	3.0	2.9	2.9	2.7
Mississippi	1.5	1.5	1.6	1.5	1.6	1.9	2.0	2.1	2.1	2.1
Colorado	2.0	2.1	2.2	2.1	2.0	1.8	1.9	1.8	1.6	1.4
Montana	.6	.6	.8	1.0	1.1	1.2	1.2	1.1	1.2	1.1
Arkansas	1.3	1.1	1.1	1.2	1.2	1.0	1.2	1.2	1.0	1.0
Kentucky	.6	.6	.7	.7	.7	1.1	.8	.7	.7	.7
Michigan	.5	.5	.4	.4	.4	.4	.6	.7	.6	.6
Other States	2.1	2.3	2.7	2.9	3.9	4.4	4.6	4.7	4.8	4.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Preliminary figures.

TABLE 10.—Production of crude petroleum in leading fields in the United States, and total production since discovery [1]

(Thousand barrels)

Field [2]	State	1962	1963	Total since discovery [3]
East Texas	Texas	38,347	40,777	3,584,855
Wilmington	California	31,725	34,647	978,258
Bay Marchand, Block 2	Louisiana	17,233	26,452	105,969
Sho-Vel-Tum	Oklahoma	24,350	24,995	622,824
Elk Basin (and South)	Montana, Wyoming	24,431	23,470	263,076
Coalinga, all fields	California	20,603	21,730	905,858
Seeligson (all zones)	Texas	20,518	20,860	255,907
Caillou Island	Louisiana	19,828	20,425	217,609
Ward-Estes	Texas	19,216	17,495	168,368
South Pass, Block 24	Louisiana	16,578	17,451	192,318
Timbalier Bay	do	14,124	16,948	99,499
Kelly-Snyder	Texas	16,139	16,838	306,307
Midway Sunset	California	14,950	16,550	929,386
West Delta, Block 30	Louisiana	12,046	16,522	59,853
Rangely	Colorado	16,230	16,262	349,051
Goldsmith	Texas	16,034	15,995	333,016
Huntington Beach	California	15,488	15,741	714,627
South Pass, Block 27	Louisiana	11,585	14,354	56,021
Loudon	Illinois	14,925	14,125	290,331
Burbank	Oklahoma	14,290	13,685	421,792
Golden Trend	do	10,730	13,427	269,024
Cowden, all fields	Texas	13,296	13,307	371,027
Wasson	do	12,268	13,099	391,209
Ventura	California	13,809	12,470	682,351
Spraberry Trend	Texas	9,400	11,984	172,499
Kern Front and Kern River	California	11,078	11,427	487,282
Swanson River-Soldatna	Alaska	10,252	10,737	28,104
Lake Washington	Louisiana	10,621	10,506	94,947
Lake Barre	do	9,476	10,231	64,661
Salem	Illinois	10,590	10,100	309,624
San Ardo	California	11,152	9,968	135,006
Slaughter	Texas	8,658	9,700	295,963
Katy, North	do	10,271	9,684	162,548
Hamilton Dome	Wyoming	9,180	9,624	100,177
High Island	Texas	6,998	9,556	84,312
Hawkins	do	8,437	8,868	287,076
Main Pass, Block 69	Louisiana	8,592	8,861	70,137
Grand Isle, Block 16	do	7,176	8,770	30,634
Buena Vista	California	8,511	8,669	515,969
Citronnelle	Alabama	6,334	8,304	41,699
Vacuum	New Mexico	5,497	8,223	109,219
Cuyama South	California	9,904	8,189	168,510
Sand Hills	Texas	7,339	8,055	103,478
Salt Creek	Wyoming	7,073	8,017	410,697
Bay St. Elaine	Louisiana	8,198	7,925	63,939
Hastings	Texas	7,431	7,770	334,361
McElroy	do	7,957	7,747	210,521
West Bay	Louisiana	7,432	7,615	71,435
Belridge, South	California	5,747	7,534	102,049

See footnotes at end of table.

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TABLE 10.—Production of crude petroleum in leading fields in the United States, and total production since discovery [1]—Continued

(Thousand barrels)

Field [2]	State	1962	1963	Total since discovery [3]
Tom O'Connor	Texas	6,841	7,389	272,885
Bayou Sale	Louisiana	6,677	7,307	87,698
Weeks Island	do	8,557	7,191	124,345
Midland Farms	Texas	5,504	7,114	81,364
Howard Glasscock	do	6,894	7,071	223,382
Oregon Basin and West	Wyoming	6,330	6,978	116,239
Eunice-Monument	New Mexico	6,741	6,769	296,617
TXL	Texas	6,677	6,635	177,388
Fullerton (and North and South)	do	6,397	6,435	161,810
Keystone	do	5,528	6,375	189,274
Magnolia	Arkansas	6,334	6,370	122,239
Grand Bay	Louisiana	5,613	6,347	83,914
Inglewood	California	6,716	6,335	240,060
Caprock and East	New Mexico	5,722	6,231	62,249
Caddo	Louisiana	5,704	6,199	275,148
Bakke	Texas	5,448	6,126	27,061
Little Creek	Mississippi	5,384	6,107	30,476
Diamond M	Texas	5,470	5,966	115,130
Agua Dulce-Stratton	do	5,610	5,895	174,786
Block 31	do	5,420	5,877	77,174
Scipio	Michigan	5,157	5,875	23,338
Emma (and Triple N)	Texas	5,252	5,845	57,995
Baxterville	Mississippi	5,808	5,823	95,453
Anahuac	Texas	3,368	5,813	166,139
Clay City	Illinois	6,495	5,725	238,061
Empire-Abo	New Mexico	5,300	5,699	20,299
Webster	Texas	5,345	5,684	268,223
Brea-Olinda	California	5,998	5,674	294,105
Grass Creek	Wyoming	5,025	5,622	91,846
Borregos	Texas	4,479	5,584	38,599
Levelland	do	3,809	5,580	134,138
Conroe	do	4,884	5,400	404,519
Thompson, all fields	do	5,135	5,374	254,317
Yates	do	5,154	5,286	482,635
Bradford-Allegheny [4]	Pennsylvania, New York	5,617	5,255	712,095
West Ranch	Texas	4,492	5,179	135,724
Red Wash	Utah	4,514	5,168	22,853
New Harmony	Illinois	5,333	5,100	120,779
Patrick Draw	Wyoming	6,590	5,096	22,119
Quarantine Bay	Louisiana	5,241	5,047	80,805
Denton (all zones)	New Mexico	5,310	5,015	92,290

[1] The data shown on this table were extracted from the Oil and Gas Journal and may not agree with the field breakdowns shown in other tables as reported.
[2] Fields under 5 million barrels not shown for current year.
[3] Includes revisions.
[4] Bureau of Mines data.

NOTE.—Fields that were shown in previous year may be grouped together with other fields and therefore cannot be shown separately.

TABLE 11.—Production of crude petroleum in Arkansas, by fields [1]

(Thousand barrels)

Field	1959	1960	1961	1962	1963 [2]
Dorcheat-Macedonia	369	633	603	518	
El Dorado	1,034	1,176	597	471	431
Fouke	960	1,106	1,074	1,067	1,022
Magnolia	4,384	4,652	5,493	6,334	6,370
McKamie	1,016	1,264	1,387	1,836	569
Midway	2,067	2,209	2,208	2,106	2,400
Schuler	2,098	1,966	1,725	1,661	1,645
Smackover	4,265	3,870	3,267	3,161	3,102
Stephens	1,655	1,253	1,108	1,064	963
Village	433	666	529	498	472
Wesson	1,615	1,749	1,539	1,381	1,163
Other fields	6,433	9,573	9,716	7,552	9,236
Total Arkansas [3]	26,329	30,117	29,246	27,649	27,373

[1] Based on Oil and Gas Journal data adjusted to Bureau of Mines total.
[2] Preliminary figures.
[3] Arkansas Oil and Gas Commission data.

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TABLE 12.—Production of crude petroleum in California by districts and fields

(Thousand barrels)

District and field	1959	1960	1961	1962	1963 [1]
San Joaquin Valley:					
Belridge	4,620	5,035	5,178	5,815	7,529
Buena Vista	9,815	9,728	8,837	8,505	8,650
Coalinga	21,225	20,621	22,926	22,547	21,404
Coles Levee	4,824	5,659	5,320	4,625	4,169
Cuyama-Russell Ranch	14,544	14,233	12,988	13,021	11,049
Edison	3,527	3,033	2,707	2,555	2,484
Elk Hill	5,126	4,368	4,026	3,865	3,659
Fresno Group	3,033	3,067	3,163	2,654	2,186
Fruitvale	2,500	2,426	2,493	2,307	2,152
Greely	2,665	2,460	2,305	1,800	2,518
Helm	883	1,272	1,337	1,046	774
Kern River-Kern Front	8,648	9,460	10,819	11,173	11,461
Kettleman North Dome	3,926	3,478	2,992	2,711	2,721
Lost Hills	1,272	1,499	1,786	2,017	2,594
McKittrick	6,512	7,287	7,589	7,292	6,378
Midway-Sunset	13,126	13,959	14,557	14,967	16,596
Mountain View	1,403	1,587	1,356	1,101	1,001
Mount Poso	3,173	2,854	2,474	1,842	2,171
Poso Creek	1,349	1,354	1,475	2,139	2,823
Raisin City	1,668	1,457	1,277	1,104	973
Rio Bravo	3,464	3,260	2,746	2,330	2,018
Round Mountain	1,467	1,408	1,296	1,197	1,164
Tejon Group	5,030	5,105	4,214	3,219	2,586
Ten Section	1,614	1,469	1,279	1,147	1,053
Wheeler Ridge	1,849	2,186	2,422	2,439	2,362
Other San Joaquin Valley	11,099	10,550	8,297	7,236	9,428
Total San Joaquin Valley	138,362	138,815	135,859	130,654	131,853
Coastal district:					
Aliso Canyon	1,876	1,723	1,578		
Cat Canyon	4,454	3,361	3,843	3,803	3,762
Newall-Potrero	2,656	2,239	2,074	1,939	1,862
Orcutt	976	925	899	1,029	1,062
Rincon	3,903	3,991	3,989	3,732	3,488
San Ardo	10,994	11,519	11,744	11,100	9,931
San Miguelita	1,341	1,166	1,064	1,048	1,062
Santa Maria	1,968	1,939	1,667	1,695	1,692
South Mountain	7,384	6,709	5,826	5,212	4,715
Ventura	18,872	17,065	16,192	13,790	12,463
Other Coastal	23,725	23,780	22,326	25,334	27,002
Total Coastal district	78,149	74,417	71,202	68,682	67,039
Los Angeles Basin:					
Brea Olinda	5,904	5,884	6,327	6,014	5,662
Coyote	2,333	4,302	4,166	4,387	6,848
Dominguez	3,417	3,572	2,974	2,704	2,685
Huntington Beach	18,110	16,761	15,889	15,497	15,647
Inglewood	4,280	4,545	5,771	6,698	6,919
Long Beach	5,841	5,615	5,253	5,048	4,899
Montebelle	1,331	1,265	1,268	1,179	1,186
Newport	2,230	1,248	1,169	1,108	1,045
Richfield	2,073	1,985	1,825	1,810	1,929
Sansinena	2,219	2,430	2,065	2,034	1,880
Santa Fe Springs	3,334	2,887	2,703	2,460	2,216
Seal Beach	3,401	3,249	3,051	3,046	2,750
Torrance	2,615	2,260	2,112	2,098	1,957
Wilmington	26,993	27,495	27,978	31,707	34,618
Other Los Angeles Basin	8,354	8,622	9,997	11,464	11,600
Total Los Angeles Basin	92,435	92,120	92,548	97,254	101,841
Total California [2]	308,946	305,352	299,609	296,590	300,733

[1] Preliminary figures.
[2] Conservation Committee of California Oil Producers data.

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TABLE 13.—Production of crude petroleum in Colorado, by fields [1]

(Thousand barrels)

Field	1959	1960	1961	1962	1963 [2]
Adena	6,463	7,567	7,744	4,697	2,992
Badger Creek-West		570	630		
Big Beaver	1,014	990	840	778	704
Black Hollow	538	470	468	534	495
Bobcat	535	389	429	480	408
Cliff	557	484	425		
Graylin-South and Northwest	524	432	471	949	1,070
Little Beaver Creek		1,601	977	715	540
Little Beaver-East	1,666	914	1,152	503	455
Mt. Hope-East and North	689				
Plum Bush Creek	790	1,021	2,931	2,885	2,282
Rangely	17,980	17,135	16,566	16,230	16,262
Wilson Creek	2,709	2,800	2,509	2,256	2,382
Yenter	509	394			
Other	12,466	12,702	11,617	12,450	10,681
Total Colorado [3]	46,440	47,469	46,759	42,477	38,271

[1] Based on Oil and Gas Journal data.
[2] Preliminary figures.
[3] Colorado Oil and Gas Conservation Commission data.

TABLE 14.—Production of crude petroleum in Illinois, by fields [1]

(Thousand barrels)

Field	1959	1960	1961	1962	1963 [2]
Albion	1,113	888	863	772	775
Benton	529	467	442	565	553
Centralia	2,160	1,420	995	1,238	875
Clay City	7,269	7,470	6,683	6,495	5,725
Dale	1,979	2,506	3,136	2,852	2,525
East Inman	1,126	746	495	593	560
Johnsonville	1,698	1,438	1,433	1,720	1,350
Loudon	12,586	12,628	13,356	14,925	14,125
New Harmony	4,758	5,252	5,246	5,333	5,100
Old Illinois (Bridgeport, Casey and Robinson-Stoy)	9,461	12,225	12,483	11,275	11,150
Phillipstown	606	653	622	665	525
Roland	1,860	1,545	1,304	1,175	1,100
Sailor Springs	1,378	1,382	1,281	1,216	1,400
Salem	6,926	8,482	9,659	10,590	10,100
Other fields	23,278	20,239	18,820	19,382	17,920
Total Illinois	76,727	77,341	76,818	78,796	73,783

[1] Based on Oil and Gas Journal data adjusted to Bureau of Mines total.
[2] Premliminary figures.

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TABLE 15.—Pipeline runs of crude petroleum in Kansas, by fields

(Thousand barrels)

Field	1959	1960	1961	1962	1963 [1]
Bemis-Shutts	4,868	4,472	4,116	3,988	3,812
Chase-Silica	3,689	3,219	2,919	3,902	2,876
El Dorado	4,443	4,291	4,239	3,986	3,773
Genesco-Edwards	1,680	1,565	1,529	1,454	1,327
Gorham	1,421	1,311	1,238	1,196	1,186
Hall-Gurney	3,253	3,229	3,291	3,199	3,232
Interstate	1,152	993	979	1,043	974
Kismet				1,099	1,118
Kraft-Prusa	2,890	2,526	2,317	2,147	1,396
Lost Springs	1,704	1,914	2,350	1,848	1,047
Marcotte	1,596	1,424	1,258	1,163	1,161
Morel	1,354	1,299	1,239	1,227	1,443
Pleasant Prairie	1,369	1,839	1,719	1,676	1,315
Ray	1,363	1,289	1,306	1,322	958
Ritz-Canton	1,321	1,199	1,120	1,396	3,731
Spivey-Grabs-Basil	2,370	2,492	3,726	3,949	2,540
Trapp	3,120	2,752	2,542	2,439	77,218
Other fields	81,950	77,530	76,353	75,042	
Total Kansas	119,543	113,344	112,241	112,076	109,107
Change in fields stocks [2]		+109			
Total Kansas production [2]	119,543	113,453	112,241	112,076	109,107

[1] Preliminary figures.
[2] Bureau of Mines data.

Source: Kansas Geological Survey.

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TABLE 16.—Production of crude petroleum in Louisiana, by districts and selected fields [1]

(Thousand barrels)

District and field	1959	1960	1961	1962	1963 [2]
Gulf Coast:					
Onshore: [3]					
Anse la Butte	1,787	1,660	1,565	1,600	1,437
Avery Island	2,696	3,097	2,985	2,714	2,696
Bastian Bay	1,152	940	2,413	2,568	3,369
Bateman Lake	3,171	2,941	3,538	2,835	2,765
Bay de Chene	1,894	2,197	2,272	2,541	2,706
Bay St. Elaine	3,965	4,720	5,596	8,198	7,925
Bayou Sale	2,961	3,613	5,387	6,677	7,307
Bully Camp	1,500	1,384	1,529	1,572	1,675
Caillou Island	15,062	16,694	17,634	19,828	20,425
Cox Bay	2,081	2,031	1,932	1,976	1,980
Delta Farms	3,675	2,923	2,885	3,018	2,974
Duck Lake	2,533	2,151	2,765	3,031	3,016
East and West White Lake	1,693	1,460	782	1,752	1,723
Erath	4,091	3,590	6,745	4,809	4,309
Garden Island	1,633	2,062	2,865	3,209	4,740
Golden Meadow	2,446	2,350	2,363	2,493	2,673
Grand Bay	3,113	4,008	3,568	5,613	6,347
Hackberry	4,992	4,850	4,413	5,791	7,522
Lafitte	3,253	3,442	3,563	4,236	4,850
Lake Barre	4,458	5,231	6,438	9,476	10,231
Lake Pelto	4,099	4,603	4,551	4,607	4,288
Lake Salvador	2,124	2,291	2,238	2,800	3,047
Lake Washington	10,902	10,863	10,618	10,621	10,506
Leeville	3,905	3,769	3,794	3,997	3,745
Little Lake	2,462	2,232	1,940	2,082	2,600
Main Pass Block 35	3,285	3,143	3,967	4,126	4,400
Paradis	2,554	2,375	2,701	2,453	2,395
Quarantine Bay	2,949	3,130	4,678	5,241	5,047
Romere Pass	2,797	2,618	3,086	2,925	3,069
South Pass Block 24	16,423	16,528	15,671	16,578	17,451
Timbalier Bay	10,220	11,695	11,860	14,124	16,948
Valentine	1,621	937	1,726	1,803	1,722
Venice	4,404	4,306	4,599	4,574	4,554
Vinton	1,729	1,656	1,622	1,801	1,805
Weeks Island	7,476	8,422	9,538	8,557	7,191
West Bay	4,957	5,282	5,945	7,432	7,615
West Cote Blanche	3,704	4,323	4,559	5,446	6,426
West Lake Verret	1,257	1,066	1,328	1,515	1,633
Other	115,053	134,830	131,702	148,616	154,687
Total onshore	270,077	295,413	307,361	343,235	359,799
Offshore: [3]					
Bay Marchand	6,093	9,858	16,723	17,233	26,452
Eugene Island	5,172	7,721	8,066	9,823	13,173
Grand Isle	7,568	9,606	11,227	13,743	14,955
Main Pass Block 69	7,417	7,305	7,227	8,592	8,861
Ship Shoal	1,814	2,247	3,771	5,517	5,527
South Pass Block (27)	5,620	7,274	8,980	11,585	14,354
South Timbalier					1,770
Vermillion				2,154	930
West Delta Block	9,801	10,278	11,131	14,043	16,522
Other	3,520	3,683	3,400	4,918	5,625
Total offshore	47,005	57,972	70,525	87,608	108,169
Total Gulf Coast	317,082	353,385	377,886	430,843	467,968
Northern:					
Buckhorn				1,199	1,865
Caddo	6,334	6,050	5,638	5,704	6,199
Cotton Valley	2,804	1,850	6,678	3,430	3,708
Delhi	5,433	5,144	5,097	4,670	4,774
Haynesville	2,472	2,781	2,220	2,513	2,638
Lake St. John	1,842	1,569	2,923	2,046	1,973
Pendelton				2,022	3,340
Sligo	1,564	1,388	1,434	2,305	2,409
Other Northern	25,135	28,665	23,086	22,421	27,865
Total Northern	45,584	47,447	47,076	46,310	54,771
Total Louisiana [4]	362,666	400,832	424,962	477,153	522,739

[1] Breakdown for individual fields from the Oil and Gas Journal.
[2] Preliminary figures.
[3] Some fields include onshore and offshore.
[4] 1959, Bureau of Mines data; 1960–63, Louisiana Conservation Department data.

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TABLE 17.—Production of crude petroleum in Mississippi, by fields [1]

(Thousand barrels)

Field	1959	1960	1961	1962	1963 [2]
Baxterville	5,801	5,901	5,949	5,808	5,823
Bolton	1,369	1,457	1,136	1,127	1,256
Brookhaven	1,928	1,924	1,571	1,498	1,545
Bryan	1,222	2,487	3,391	2,068	2,017
Cranfield	805	1,099	901	905	863
Diamond	1,040	1,166	924	751	640
Eucutta	1,533	1,363	1,261	1,151	1,088
Heidelberg	3,262	3,302	3,974	3,737	3,620
La Grange and South	1,755	1,453	1,471	1,322	1,234
Little Creek	5,460	5,669	6,431	5,384	6,107
Mallalieu	761	601	562	596	583
McComb		2,533	2,949	4,383	4,482
Pistol Ridge Maxie	1,207	1,000	651	736	762
Raleigh	2,138	2,157	1,820	1,392	1,573
Soso	4,695	3,901	3,418	2,998	2,643
Tinsley	3,421	3,234	2,991	2,835	2,855
Yellow Creek	1,292	1,170	1,222	1,492	1,409
Other fields	11,931	11,256	14,066	17,530	20,252
Total Mississippi	49,620	51,673	54,688	55,713	58,752

[1] From Oil and Gas Journal based on data from Mississippi State Oil and Gas Board.
[2] Preliminary figures.

TABLE 18.—Production of crude petroleum in Montana, by fields

(Thousand barrels)

Field	1959	1960	1961	1962	1963 [1]
Big Wall	204	264	401	363	276
Bowes	333	280	241	188	172
Cabin Creek	4,350	4,470	4,198	3,854	3,457
Cat Creek	151	181	238	220	234
Cut Bank	2,004	2,078	2,036	1,912	1,777
Elk Basin	4,065	2,718	2,690	3,694	3,269
Glendive	505	456	519	458	421
Kevin-Sunburst	833	744	666	614	549
Pine	4,832	5,112	5,212	4,726	4,191
Pondera	521	505	496	463	427
Poplar	3,775	3,232	2,386	1,856	1,593
Reagan	175	190	153	211	232
Sumatra	2,013	2,145	2,463	2,332	1,735
Other fields	6,096	7,865	9,207	10,757	12,542
Total Montana [2]	29,857	30,240	30,906	31,648	30,875

[1] Preliminary figures.
[2] Montana Oil and Gas Conservation Commission data.

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TABLE 19.—Production of crude petroleum in New Mexico, by districts and fields[1]

(Thousand barrels)

District and field	1959	1960	1961	1962	1963 [2]
Southeast:					
Allison	681	1,085	5,961	4,697	2,742
Anderson Ranch	1,132	1,056	995	1,211	
Artesia	946	870	1,075	942	787
Bagley	1,188	1,156	1,071	974	1,035
Blinebry					1,237
Caprock-East	6,581	5,525	5,881	5,722	6,231
Corbin and South					1,281
Crossroad	1,426	1,480	1,941	2,028	1,412
Denton	7,141	6,293	5,841	5,310	5,015
Dollarhide-West	1,855	1,607	1,285	965	779
Drinkard	1,597	1,465	1,375	1,504	1,605
Empire-Abo	797	3,513	4,836	5,300	5,699
Eumont	2,843	2,199	1,930	1,624	1,379
Eunice-Monument	7,896	7,632	7,039	6,741	6,769
Fowler	711	712	680	632	681
Gladiola	7,046	6,031	5,901	4,763	3,292
Grayburg-Jackson	1,554	1,707	1,598	1,422	1,337
Hobbs	3,399	3,357	3,272	3,230	3,353
Jalmat	2,167	1,848	1,564	1,370	1,360
Justis	2,209	3,198	2,670	3,238	3,370
Kemnitz-Wolfcamp	1,872	1,910	1,510	1,563	927
Langlie-Mattix	2,289	2,955	2,696	2,121	1,690
Lovington-East	2,337	2,137	1,988	1,896	1,810
Maljamar	2,730	2,820	3,008	2,950	2,825
Moore	1,014	954	863	814	824
Pearl-Queen	620	939	1,085	997	803
Saunders-South	2,476	2,306	1,993	1,502	1,109
Townsend-Wolfcamp	1,253	795	621	481	439
Vacuum	3,709	4,061	4,691	6,291	8,223
Warren	1,194	1,095	944	866	671
Other fields	22,784	20,268	22,559	27,897	31,165
Northwest:					
Bisti Gallup	6,570	4,736	3,500	2,655	2,378
Cha Cha			2,713	1,075	756
Horseshoe-Gallup	3,538	4,615	3,688	2,175	1,491
Totah Gallup			1,707	460	
Verde Gallup	1,863	2,003	845	524	
Other fields	274	5,052	3,227	3,388	5,138
Total New Mexico [3]	105,692	107,380	112,553	109,328	109,613

[1] Based on Oil and Gas Journal data.
[2] Preliminary figures.
[3] New Mexico Oil and Gas Conservation Commission data.

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TABLE 20.—Production of crude petroleum in Oklahoma, by fields [1]

(Thousand barrels)

Field	1959	1960	1961	1962	1963 [2]
Allen	1,676	1,525	1,403	1,390	1,445
Atlantic	1,047	1,111	1,171	1,462	1,450
Beebe	606	697	749	814	962
Bradley	2,898	2,631	3,048	3,273	([3])
Burbank	14,463	15,676	15,275	14,290	13,685
Cache Creek	910	1,041	1,231	893	915
Cement	4,222	3,836	4,038	3,533	3,340
Cumberland	1,407	1,219	1,213	1,142	1,133
Cushing	2,585	2,515	2,537	2,629	2,828
Davenport	855	613	654	555	534
Dover-Hennessey			4,841	8,945	9,010
Doyle	2,241	1,798	1,671	1,313	1,219
Elk City	2,113	1,741	1,398	937	840
Eola-Robberson	3,863	3,470	3,624	3,444	3,384
Fitts	910	950	983	930	810
Garber	876	761	595	657	751
Glenn Pool	3,164	3,200	3,368	3,490	3,303
Golden Trend	10,627	11,071	10,202	10,730	[3] 13,427
Healdton	2,256	2,154	2,353	2,513	2,506
Hewitt	2,977	2,938	2,989	2,550	2,461
Holdenville-East	412			1,210	1,100
Hoover-Northwest	2,039	1,329	802	820	668
Joiner City	395	1,561	2,054	1,980	2,296
Knox	941	2,206	2,039	1,390	
Lincoln			424	1,395	1,494
Loco	1,290	1,309	1,517	1,738	1,848
Lucien	749	710	699	721	658
Moore-West	1,527	1,275	1,294	1,066	685
Naval Reserve	1,667	2,353	2,456	2,367	2,170
Oklahoma City	3,050	2,851	2,617	2,381	2,300
Olympic	1,101	967	787	650	529
Payson-East	423	893	1,421	2,005	1,308
Seminole:					
Bowlegs	665	905	1,125	1,240	1,110
Little River	390	388	354	339	340
St. Louis	1,379	1,422	1,449	1,440	1,535
Seminole	797	696	666	726	785
Sho-Vel-Tum	25,175	24,227	24,510	24,350	24,995
West Edmond	1,013	1,407	1,212	1,179	1,150
Yale-Quay	1,700	1,254	979	796	673
Other fields	93,681	88,213	83,333	89,449	90,591
Total Oklahoma	198,090	192,913	193,081	202,732	200,238

[1] Based on Oil and Gas Journal data adjusted to Bureau of Mines total.
[2] Preliminary figures.
[3] Consolidation: Bradley into Golden Trend.

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TABLE 21.—Production of crude petroleum in Texas, by districts and selected fields [1]

(Thousand barrels)

District [2] and field	1959	1960	1961	1962	1963 [3]
Gulf Coast:					
Amelia	637	706	1,283	1,726	1,384
Anahuac	4,066	3,484	3,489	3,368	5,813
Chocolate Bayou	3,836	3,953	3,657	3,530	3,409
Conroe	6,017	5,162	5,375	4,884	5,400
Dickinson-Gillock	3,125	2,872	3,056	2,952	2,871
Goose Creek	2,633	2,466	2,268	2,500	2,638
Hasting	9,290	7,786	7,744	7,431	7,770
High Island	4,112	4,906	5,334	6,998	9,556
Hull and Merchant	3,919	3,616	3,498	3,756	4,591
Katy, North	9,232	9,112	9,204	10,271	9,684
Liberty, South	3,548	3,528	2,942	3,065	2,750
O'Connor, Tom	6,460	6,532	6,432	6,841	7,389
Old Ocean	5,129	4,180	4,261	3,819	3,424
Oyster Bayou	2,145	1,812	1,769	1,714	1,800
Pierce Junction	3,818	2,928	2,564	2,168	1,887
Thompson	5,673	5,188	5,298	5,135	5,374
Village Mills	2,081	1,562	1,683	1,819	1,763
Webster	6,859	5,802	5,629	5,345	5,684
West Columbia	3,032	3,079	2,849	2,759	2,419
West Ranch	4,729	4,101	4,295	4,492	5,179
Other Gulf Coast	92,659	84,393	86,591	94,592	96,302
Total Gulf Coast	183,000	167,168	169,221	179,165	187,087
East Texas:					
East Texas Field	53,691	48,704	48,583	43,829	40,777
Hawkins	9,845	9,173	8,897	8,437	8,868
New Hope	2,752	2,595	4,206	3,740	3,491
Quitman	2,568	2,994	3,203	2,757	2,425
Talco	4,284	3,654	4,238	4,551	4,428
Van and Van Shallow	5,312	4,896	4,803	4,657	4,841
Other East Texas	27,951	29,208	28,851	34,795	37,870
Total East Texas	106,403	101,224	102,781	102,766	102,700
Central Texas:					
Darst Creek	3,336	4,024	2,414	3,013	2,585
Luling	2,715	2,319	2,081	2,086	2,010
Other Central Texas	9,334	10,127	11,556	10,652	11,329
Total Central Texas	15,385	16,470	16,051	15,751	15,924
South Texas:					
Aqua Dulce-Stratton	5,222	5,039	3,673	5,610	5,895
Borregos	2,632	2,399	4,105	4,479	5,584
Kelsey	2,726	2,269	2,925	2,744	2,986
Plymouth	3,847	3,833	3,548	2,910	2,726
Portilla	1,353	2,085	2,239	2,158	1,901
Seeligson	14,918	10,918	19,342	20,518	20,860
Sun	1,261	1,571	1,563	1,639	1,530
Tijerina-Canales	2,242	2,211	2,114	2,237	2,510
White Point	2,477	2,137	2,119	2,063	1,843
Other South Texas	34,381	35,862	27,029	27,955	29,214
Total South Texas	71,059	68,324	68,657	72,313	75,049
North Texas	120,307	117,302	116,244	117,924	120,000
Panhandle	36,750	38,570	38,772	37,562	37,339

See footnotes at end of table.

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TABLE 21.—Production of crude petroleum in Texas, by districts and selected fields [1]—Continued

(Thousand barrels)

District and field	1959	1960	1961	1962	1963 [2]
West Texas:					
Adair	1,834	1,827	1,808	1,704	1,752
Andector	3,427	2,942	2,505	2,546	2,822
Anton-Irish-Anton	1,909	1,741	1,701	2,868	1,769
Bakke	3,050	4,161	4,751	5,448	6,126
Block 31	5,809	5,821	5,800	5,420	5,877
Cedar Lake	1,075	1,152	1,346	1,551	1,554
Cogdell	6,047	5,103	3,219	4,805	4,710
Cowden, South and Foster	14,086	13,820	14,102	13,296	13,307
Diamond M	7,627	6,451	5,711	5,470	5,966
Dollarhide	3,008	2,656	2,402	2,596	2,369
Dune	4,547	4,856	4,287	5,234	4,776
Emma and Tripple "N"	5,961	5,750	5,743	5,252	5,845
Fort Chadborne	3,390	2,742	2,598	2,557	1,742
Fuhrman	4,226	4,135	3,793	3,278	3,331
Fullerton	6,493	6,060	6,187	6,397	6,435
Garza	2,045	1,770	1,696	1,531	1,630
Goldsmith	20,164	20,956	19,070	16,034	15,995
Good	1,202	1,391	1,393	1,862	1,627
Headlee	3,469	5,003	5,490	3,456	1,364
Hendrick	2,283	2,151	1,815	1,602	1,728
Howard-Glasscock	6,499	6,312	6,857	6,894	7,071
Iatan-East and North	1,847	1,807	1,811	2,287	2,935
Jameson	2,994	2,569	2,329	2,173	1,925
Jo-Mill	3,784	2,970	2,632	2,250	2,070
Jordan	3,024	2,671	2,591	2,458	2,564
Kelly Snyder	20,056	14,929	16,894	16,139	16,838
Kermit	5,271	6,143	5,290	4,834	4,858
Keystone	5,963	5,368	7,456	5,528	6,375
Levelland	6,346	5,879	5,787	3,809	5,580
McCamey	1,986	1,971	1,944	2,071	2,034
McElroy	9,810	8,928	8,407	7,957	7,747
Mabee	1,697	1,544	1,701	1,818	1,888
Magutex	2,501	2,170	2,128	2,009	2,162
Means	4,468	3,546	3,753	4,623	4,736
Midland Farms	5,829	4,685	5,045	5,504	7,114
Pegasus	3,998	3,838	4,737	5,114	4,734
Penwell	2,761	3,123	2,736	2,766	2,976
Prentice	4,377	3,654	6,457	3,220	3,190
Robertson	3,214	3,174	3,639	3,650	3,705
Russell	5,422	4,927	4,999	4,491	3,009
Salt Creek	3,879	3,264	3,181	3,056	3,212
Sand Hills	5,189	4,687	4,749	7,339	8,055
Seminole	3,782	2,558	3,247	2,425	3,534
Shafter Lake	2,576	2,398	2,323	2,263	2,149
Sharon Ridge	2,384	2,352	2,255	2,138	2,047
Slaughter	9,062	8,553	8,615	8,658	9,700
Sprayberry Trend	13,558	12,131	10,801	9,400	11,984
TXL	6,759	9,243	6,280	6,677	6,635
University	4,121	3,830	4,160	4,673	5,634
Vealmoor-East	2,024	1,778	1,692	1,606	1,665
Waddell	2,376	2,255	2,165	1,815	2,206
Ward-Estes	14,616	15,032	17,095	19,216	17,495
Wasson	12,692	11,711	11,212	12,268	13,099
Welch	2,284	2,098	1,928	2,134	2,356
World	1,822	1,677	1,956	1,549	1,383
Yarbrough	1,311	1,118	1,014	3,991	1,542
Yates	6,372	5,475	4,427	5,154	5,286
Other West Texas	140,768	137,565	150,755	140,983	152,760
Total West Texas	439,074	418,421	427,465	417,847	434,998
Total Texas [4]	971,978	927,479	939,191	943,328	973,097

[1] Breakdown of individual fields from Oil and Gas Journal.
[2] See section on "Districts" under "General Summary."
[3] Preliminary figures.
[4] As reported by the companies to the Bureau of Mines from the year 1959–62, 1963 data from Oil and Gas Journal.

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TABLE 22.—Production of crude petroleum in Wyoming, by fields [1]

(Thousand barrels)

Field	1959	1960	1961	1962	1963 [2]
Beaver Creek	2,389	2,782	3,079	2,200	3,349
Big Muddy	2,260	2,223	1,914	1,709	1,723
Big Sand Draw	2,489	1,982	1,731	1,443	1,008
Birch Creek					1,647
Bonanza	3,497	2,695	1,896	1,070	1,001
Byron-Byron and Garland	7,820	7,907	7,826	7,735	7,687
Cottonwood	2,750	2,124	2,197	2,170	2,031
Coyote Creek	514	815	2,287	2,390	2,069
Donkey Creek	1,852	2,567	1,700	1,246	1,089
Elk Basin	18,214	18,803	20,603	24,431	23,470
Fiddler Creek	724	1,217	1,676	2,025	2,943
Four Bear	1,744	3,083	3,492	3,104	1,903
Frannie	2,812	2,718	2,567	1,958	2,042
Gebo	1,163	1,226	1,148	915	823
Glenrock-South	2,509	2,017	1,975	1,826	1,394
Grass Creek	4,619	4,543	4,602	5,025	5,622
Grieve Unit	3,440	4,145	3,471	2,015	2,335
Hamilton Dome	9,294	12,045	10,568	9,180	9,624
Lance Creek	1,222	1,188	800	780	779
Little Buffalo	2,250	2,039	2,512	2,025	1,936
Lost Soldier-Bairoil	6,135	5,989	5,666	3,031	3,125
Murphy Dome	2,909	3,001	2,550	2,240	1,670
Oregon Basin	5,183	5,234	5,875	6,330	6,978
Patrick Draw		2,339	8,117	6,590	5,096
Raven Creek			1,700	3,075	2,182
Rozet		425	1,717	1,530	1,592
Salt Creek and East	7,500	9,515	9,235	7,073	8,661
Steamboat Butte	3,188	2,901	3,012	3,025	2,643
Sussex Meadow	6,955	6,387	5,196	3,755	2,694
Wertz	2,233	2,273	2,242	2,250	2,316
Winkleman Dome	3,353	3,114	2,726	2,515	601
Other fields	17,032	16,613	17,857	21,186	32,374
Total Wyoming [3]	126,050	133,910	141,937	135,847	144,407

[1] Breakdown for individual fields from the Oil and Gas Journal.
[2] Preliminary figures.
[3] Bureau of Mines data.

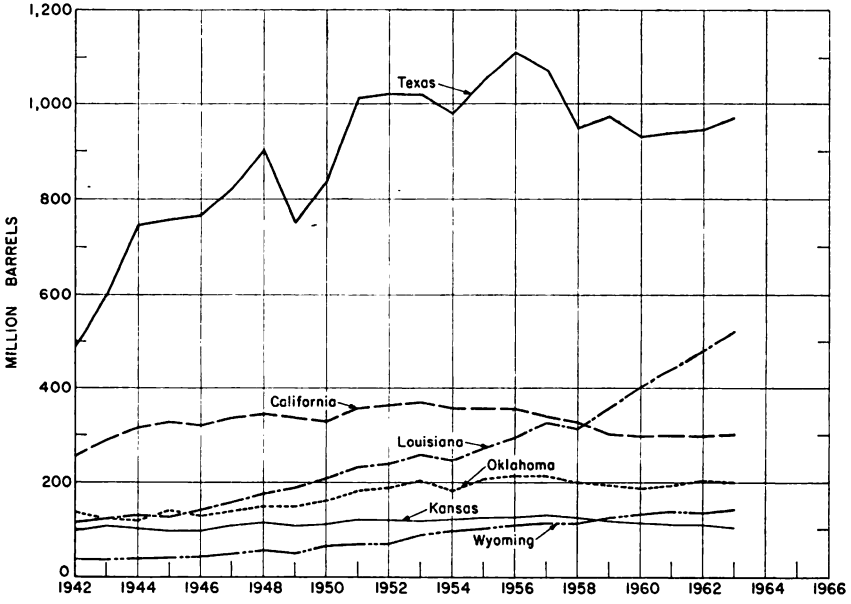

FIGURE 3.—Production of crude petroleum in the United States, 1942–63, by principal producing States.

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WELLS

Drilling continued to decline in 1963 and the number of wells drilled (41,386) was 2,393 less than in 1962. Service wells are not included in this total. The percentage of dry holes to the total wells drilled increased from 38.1 percent in 1962 to 39.5 percent in 1963.

The States showing the largest decline in drilling activity for the year were Texas with 1,397 fewer wells drilled; Oklahoma, 593 less; and New Mexico, 382 less. Louisiana reported the only substantial increase in the number of new wells drilled and this occurred in the inland area of the State.

The number of oil wells reported in operation as of December 31, 1963, was 595,462, and the average daily production per well was 12.7 barrels. Although several States reported increases in the number of wells operating at the close of the year, these gains were offset by the 5,611 decline reported for Pennsylvania.

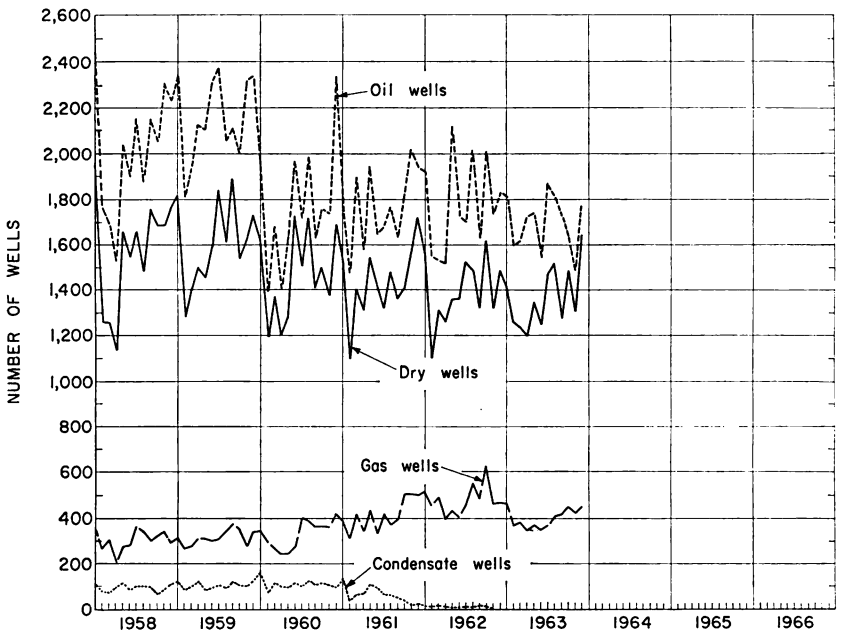

FIGURE 4.—Wells drilled for oil and gas in the United States, 1958–63, by months.

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TABLE 23.—Wells drilled for oil and gas in the United States, by months

Wells	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	
													Number	Percent
1962:														
Oil	1,912	1,544	1,529	1,514	2,118	1,722	1,699	2,018	1,624	2,010	1,729	1,830	21,249	48.5
Condensate	14	9	17	13	8	10	12	10	16	13	1	------	123	0.3
Gas	515	450	489	394	428	402	451	551	486	628	463	468	5,725	13.1
Dry	1,560	1,100	1,309	1,259	1,357	1,359	1,522	1,481	1,319	1,615	1,321	1,480	16,682	38.1
Total	4,001	3,103	3,344	3,180	3,911	3,493	3,684	4,060	3,445	4,266	3,514	3,778	43,779	100.0
1963:														
Oil	1,809	1,593	1,611	1,721	1,737	1,542	1,860	1,809	1,725	1,633	1,480	1,768	20,288	49.0
Gas [1]	459	366	379	342	367	349	367	406	412	443	418	443	4,751	11.5
Dry	1,405	1,251	1,229	1,194	1,342	1,248	1,469	1,513	1,271	1,485	1,302	1,638	16,347	39.5
Total	3,673	3,210	3,219	3,257	3,446	3,139	3,696	3,728	3,408	3,561	3,200	3,849	41,386	100.0

[1] Includes condensate wells.

Source: Oil and Gas Journal.

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TABLE 24.—Wells drilled for oil and gas in the United States, by States and districts

State and district	1962					1963			
	Oil	Condensate	Gas	Dry	Total	Oil	Gas [1]	Dry	Total
Alabama	25			15	40	71		24	95
Alaska	6		5	29	40	8	5	12	25
Arizona	1		9	44	54	1	2	13	16
Arkansas	117		48	203	368	207	43	204	454
California	1,867		163	481	2,511	1 707	118	566	2,391
Colorado	143	1	88	525	757	96	93	409	598
Florida	1			3	4	1		1	2
Georgia				1	1				
Idaho								2	2
Illinois	727		11	768	1,506	746	12	764	1,522
Indiana	199		7	470	676	271	8	450	729
Iowa						1		12	13
Kansas	1,779	2	230	1,715	3,726	2,017	227	1,590	3,834
Kentucky	663		223	692	1,578	653	162	825	1,640
Louisiana:									
Gulf Coast	1,110	2	366	1,096	2,574	1,063	275	1,079	2,417
Northern	1,079	6	350	970	2,405	1.482	339	1,036	2,857
Total Louisiana	2,189	8	716	2,066	4,979	2,545	614	2,115	5,274
Maryland								1	1
Michigan	129		71	497	697	143	84	382	609
Mississipoi	199	6	20	378	603	254	22	448	724
Missouri				11	11			9	9
Montana	177		19	224	420	155	15	212	382
Nebraska	173		5	511	689	153	1	366	520
Nevada				7	7			2	2
New Jersey								1	1
New Mexico:									
West	117	1	396	129	643	112	239	119	470
East	650	1	23	324	998	480	42	267	789
Total New Mexico	767	2	419	453	1,641	592	281	386	1,259
New York	148		43	51	242	246	22	40	308
North Carolina				3	3				
North Dakota	104			123	227	84		98	182
Ohio	568		261	284	1,113	475	217	357	1,049
Oklahoma	2,605	95	477	1,379	4,556	2,273	430	1,260	3,963
Oregon				6	6			1	1
Pennsylvania	210		271	110	591	250	220	73	543
South Dakota				11	11	1		9	10
Tennessee	2		3	38	43	3		26	29
Texas:									
Gulf Coast	824	1	466	874	2,165	810	383	882	2,075
West	2,531	1	123	839	3,494	2,080	163	799	3,042
East	619		99	374	1,092	307	91	321	719
Other districts	3,958		856	2,732	7,546	3,485	671	2,908	7,064
Total Texas	7,932	2	1,544	4,819	14,297	6,682	1,308	4,910	12,900
Utah	89	3	50	141	283	67	21	121	209
Virginia			10	7	17		2	1	3
Washington				8	8			7	7
West Virginia	167		952	142	1,261	257	791	151	1,199
Wyoming	262	4	80	467	813	329	53	499	881
Total United States	21,249	123	5,725	16,682	43,779	20,288	4,751	16,347	41,386

[1] Includes condensate wells.

Source: Oil and Gas Journal.

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TABLE 25.—Producing oil wells in the United States and average production per well per day, by States

State	Producing oil wells			
	1962		1963 [1]	
	Approximate number of producing oil wells, Dec. 31	Average production per well per day (barrels)[2]	Approximate number of producing oil wells, Dec. 31	Average production per well per day (barrels)[2]
Alabama	449	47.2	502	52.8
Alaska	52	573.6	54	555.2
Arkansas	5,918	12.4	6,010	12.6
California	39,265	21.9	40,233	20.7
Colorado	2,110	56.3	2,030	50.7
Illinois	30,174	6.9	30,149	6.7
Indiana	5,607	5.8	5,951	5.4
Kansas	46,750	7.0	46,951	6.4
Kentucky	19,448	2.5	19,297	2.7
Louisiana:				
Gulf Coast	13,813	88.6	14,571	90.3
Northern	12,569	10.4	13,067	11.7
Total Louisiana	26,382	51.1	27,638	53.0
Michigan	4,282	10.9	4,234	10.3
Mississippi	2,560	56.8	2,682	61.4
Montana	3,692	24.7	3,642	23.1
Nebraska	1,764	37.6	1,726	34.2
New Mexico:				
Southeastern	14,333	19.3	14,921	18.7
Northwestern	1,769	17.3	1,875	14.7
Total New Mexico	16,102	19.1	16,796	18.3
New York	13,537	.3	13,431	.4
North Dakota	1,794	39.7	1,824	37.8
Ohio	16,867	.9	17,016	1.0
Oklahoma	80,799	6.9	81,475	6.8
Pennsylvania	59,673	.2	54,062	.2
Texas: [3]				
Gulf Coast	19,491	25.4	19,601	26.2
East Texas proper	19,424	6.2	19,104	6.2
West Texas	65,236	17.7	66,144	18.1
Other districts	93,508	8.9	93,221	9.1
Total Texas	197,659	13.1	198,070	13.5
Utah	852	103.3	835	108.6
West Virginia	12,880	.7	13,044	.7
Wyoming	7,581	48.1	7,611	52.1
Other States:				
Arizona	4	21.4	9	23.2
Florida	11	104.4	12	110.5
Missouri	105	1.4	105	1.4
Nevada	4	96.6	4	65.8
South Dakota	19	24.4	24	23.8
Tennessee	40	1.1	39	1.0
Virginia	5	1.6	6	1.5
Total other States	188	12.2	199	12.4
Total United States	596,385	12.3	595,462	12.7

[1] Preliminary figures.
[2] Based on the average number of wells during the year.
[3] Divisions of the Texas Railroad Commission.

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TABLE 26.—Runs to stills of crude petroleum in the United States in 1963, by districts and month [1]

(Thousand barrels)

District [2]	January	February	March	April	May	June	July	August	September	October	November	December	Total
East Coast:													
Domestic	14,416	13,577	15,255	18,775	14,717	15,361	15,218	15,713	13,756	12,431	13,085	12,559	174,863
Foreign	21,146	20,173	21,160	16,705	19,596	19,808	21,151	20,622	20,292	19,483	19,932	22,070	242,138
Total East Coast	35,562	33,750	36,415	35,480	34,313	35,169	36,369	36,335	34,048	31,914	33,017	34,629	417,001
Appalachian No. 1:													
Domestic	2,845	2,494	2,919	2,281	2,560	2,827	2,847	2,634	2,772	2,268	2,424	2,719	31,590
Foreign	428	333	313	398	466	494	533	638	568	591	619	647	6,028
Total Appalachian No. 1	3,273	2,827	3,232	2,679	3,026	3,321	3,380	3,272	3,340	2,859	3,043	3,366	37,618
Appalachian No. 2	3,130	3,013	3,145	2,390	3,094	2,853	3,267	3,348	3,276	3,228	2,663	2,862	36,269
Indiana, Illinois, Kentucky, etc.:													
Domestic	45,892	44,423	49,269	43,158	43,875	46,761	49,094	47,442	47,383	47,653	44,609	46,433	555,992
Foreign	1,208	1,143	1,412	1,405	1,111	1,282	1,260	1,188	1,073	892	968	931	13,873
Total Indiana, Illinois, Kentucky, etc.	47,100	45,566	50,681	44,563	44,986	48,043	50,354	48,630	48,456	48,545	45,577	47,364	569,865
Minnesota, Wisconsin, North Dakota, and South Dakota:													
Domestic	2,493	2,023	2,295	2,207	1,939	1,494	2,720	2,735	2,386	2,642	2,396	2,454	27,784
Foreign	1,756	1,844	2,010	1,700	1,175	1,624	1,682	1,864	1,609	1,950	1,823	2,130	21,167
Total Minnesota, Wisconsin, North Dakota, and South Dakota	4,249	3,867	4,305	3,907	3,114	3,118	4,402	4,599	3,995	4,592	4,219	4,584	48,951
Oklahoma, Kansas, etc.	23,419	22,091	23,223	19,758	23,167	22,845	24,474	23,996	22,760	21,804	21,824	22,872	272,233
Texas Inland	10,091	9,020	9,536	8,259	9,790	9,818	9,951	9,662	9,177	9,437	8,809	9,384	112,934
Texas Gulf Coast:													
Domestic	64,547	60,786	63,512	62,242	65,399	62,347	63,498	65,741	58,617	65,627	65,395	65,607	763,318
Foreign	60	10	5	59	3	12	19	----	14	----	95	----	277
Total Texas Gulf Coast	64,607	60,796	63,517	62,301	65,402	62,359	63,517	65,741	58,631	65,627	65,490	65,607	763,595
Louisiana Gulf Coast:													
Domestic	24,157	22,233	23,085	22,238	23,414	22,310	22,235	21,964	23,840	25,925	24,821	26,269	282,491
Foreign	73	----	68	18	26	63	53	34	32	83	41	116	607
Total Louisiana Gulf Coast	24,230	22,233	23,153	22,256	23,440	22,373	22,288	21,998	23,872	26,008	24,862	26,385	283,098
Arkansas, Louisiana Inland, etc.	3,469	3,418	3,604	3,658	3,829	3,747	3,267	3,999	3,619	3,928	3,769	3,673	43,980
New Mexico	896	772	776	685	777	913	868	968	900	708	847	834	9,944

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Rocky Mountain:													
Domestic	9,513	8,648	8,671	7,170	9,219	9,362	9,900	9,832	9,533	8,995	9,004	8,897	108,744
Foreign	267	186	331	240	247	341	305	267	254	241	375	375	3,429
Total Rocky Mountain	9,780	8,834	9,002	7,410	9,466	9,703	10,205	10,099	9,787	9,236	9,379	9,272	112,173
West Coast:													
Domestic	27,688	25,311	28,994	26,103	27,909	28,334	28,634	30,052	28,542	29,257	28,345	28,857	338,026
Foreign	11,944	9,924	9,409	10,267	11,623	10,993	11,688	10,833	9,803	9,741	9,157	9,583	124,965
Total West Coast	39,632	35,235	38,403	36,370	39,532	39,327	40,322	40,885	38,345	38,998	37,502	38,440	462,991
Total United States:													
Domestic	232,556	217,809	234,284	218,924	229,689	228,972	235,973	238,086	226,561	233,903	227,991	233,420	2,758,168
Foreign	36,882	33,613	34,708	30,792	34,247	34,617	36,691	35,446	33,645	32,981	33,010	35,852	412,484
Grand total:													
1963	269,438	251,422	268,992	249,716	263,936	263,589	272,664	273,532	260,206	266,884	261,001	269,272	3,170,652
1962	265,277	241,965	253,988	242,961	256,283	258,782	264,437	262,528	252,663	256,073	251,025	263,649	3,069,631
Daily average 1963	8,692	8,979	8,677	8,324	8,514	8,786	8,796	8,824	8,674	8,609	8,700	8,686	8,687

[1] Preliminary figures.
[2] Where no breakdown is shown, runs were all domestic crude.

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CONSUMPTION AND DISTRIBUTION

The total demand for crude oil in the United States in 1963 was 8,712,400 barrels daily, a gain of 3.3 percent for the year. Most of the increase was in the demand for domestic crude oil which increased from 7,313,400 barrels daily in 1962 to 7,581,200 barrels daily in 1963. The demand for foreign crude oil was 1,131,200 barrels daily.

Runs to Stills.—Crude runs to stills in 1963 averaged 8,687,000 barrels daily, including 7,557,000 barrels daily of domestic crude oil and 1,130,000 barrels daily of foreign-origin crude. This represented a gain of 3.3 percent for the year in total crude runs to stills, 3.7 percent increase for domestic crude oil, and 0.7 percent in foreign crude.

Distribution.—The Bureau of Mines collects data on receipts of domestic and foreign crude petroleum at refineries in the United States. These receipts include the crude runs to stills, a small quantity used as refinery fuel, and any increase in crude stocks at refineries. Classification of receipts, by State of origin, shows receipts from local production (intrastate), receipts from other States (interstate), and receipts of imported crude. Classification by method of transportation indicates the final receipts by water, pipeline, and tank car and truck. Receipts of domestic crude by water usually were moved by pipeline from the point of production to the point of water shipment.

Receipts of domestic and foreign crude petroleum at refineries totaled 3,168.0 million barrels in 1963; foreign crude represented 13.0 percent of this total. The refineries processed 3,170.6 million barrels and reported 0.7 million barrels used for refinery fuel and losses; the difference was 3.3 million barrels withdrawn from stocks.

Refineries received 74.7 percent of their supply of crude oil by pipeline, 24.0 percent by water and the remainder by tank cars and trucks.

The major waterborne shipments were from the gulf coast to the east coast and between States in the gulf-coast districts. There are also interstate and intrastate shipments by water on the west coast and Mississippi River.

All foreign crude receipts into the east coast and the major part of those into the gulf coast are received by water. Refineries in District II, which comprises the Great Lakes and the midcontinent areas, receive most of their foreign crude by pipeline from Canada; however, some is barged up the river from gulf-coast ports where it arrived by tanker. Very little foreign crude is processed at refineries in the Rocky Mountain States; such crude as is used arrives at the refineries by pipeline and rail from Canada. West coast refiners received 63 percent of their foreign crude supply by water, the rest was received by pipeline at refineries near the Canadian border.

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TABLE 27.—Receipts of domestic and foreign crude petroleum at refineries in the United States

(Million barrels)

Method of transportation	1959	1960	1961	1962	1963 [1]
By water:					
Intrastate	134.1	125.8	136.0	140.9	129.8
Interstate	242.7	261.6	268.3	277.6	307.1
Foreign	316.8	330.0	317.1	330.2	322.2
Total by water	693.6	717.4	721.4	748.7	759.1
By pipeline:					
Intrastate	1,282.8	1,291.6	1,286.1	1,333.4	1,377.2
Interstate	868.5	857.4	871.9	865.8	900.8
Foreign	33.4	40.6	64.1	79.7	90.1
Total by pipeline	2,184.7	2,189.6	2,222.1	2,278.9	2,368.1
By tank cars and trucks:					
Intrastate	31.8	33.9	34.9	36.9	36.2
Interstate	9.2	10.1	8.1	6.2	4.5
Foreign			0.5	0.1	0.1
Total by tank cars and trucks	41.0	44.0	43.5	43.2	40.8
Grand total	2,919.3	2,951.0	2,987.0	3,070.8	3,168.0

[1] Preliminary figures.

Demand by States of Origin.—Distribution of domestic crude oil by refining States and districts can be analyzed from receipts of crude oil at refineries. When long-distance shipments are involved, various crudes may be mixed in transit or storage, and identification by origin may be only approximate.

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TABLE 28.—Refinery receipts of domestic crude oil by States and districts, 1963

(Thousands of barrels)

Receiving State and district	Total domestic receipts	Intrastate receipts	Interstate receipts from—																		
			Ala. and Miss.	Ark.	Calif., Nev. and Alaska	Colo.	N.Y. and Fla.	Ill.	Ind. and Mich.	Kans.	Ohio and Ky.	La.	Mont	Nebr., N. Dak., and S. Dak.	New Mex.	Okla.	Texas	Utah	W. Va.	Wyo.	Total
Delaware, [1]Massachusetts, Rhode Island	9,102											8,111					991				9,102
Florida, Georgia, South Carolina, Virginia	2,752	54	1,982														716				2,698
Maryland	105		105																		105
New Jersey	61,568		3,765				516					34,992					22,295				61,568
New York:																					
East																					
West	13,399							1,021					5,147			4,426	2,805				13,399
Pennsylvania:																					
East	102,392		6,985									34,067					61,340				102,392
West	15,631	6,048				856	1,929				1,163		2,364	859		1,007			1,405		9,583
West Virginia	2,454	1,610									844										844
Total district 1	207.403	7,712	12,837			856	2,445	1,021			2,007	77,170	7,511	859		5,433	88,147		1.405		199,691
Illinois	214,868	28,485				2,909			814	10,482		1,505		376	18,096	29,792	109,477	1,389		11,543	186,383
Indiana	153,129	1,504				5,684		7,450	87	19,817	30		11,094	10,558	8,520	34,959	22,907			30,519	151,625
Kansas	112,636	85,114				5,043								1,436	6,286	11,086	3,659			12	27,522
Kentucky, Tennessee	40,049	20,488	2,330						2,550			14,681									19,561
Michigan	45,161	18,304				38		4,270									10,516			12,033	26,857
Minnesota, Wisconsin	11,684												39	7,776						3,869	11,684
Missouri	22,747									102				120	10,341	1,768	5,107			5,309	22,747
Nebraska	970																			970	970
North Dakota	16,062	15,979											83								83
Ohio:																					
East	36,249	4,141	269			600		22,831			1,154	3,227	132			306				3,589	32,108
West	102,461	44	3,234	1,517		3,743		13,988	324			18,582	30	3,598	3,910	5,592	45,787			2,112	102,417
Oklahoma	135,799	102,110				116				8,456				1	868		19,861	4,387			33,689
Total district 2	891,815	276,169	5,833	1,517		18,133		48,539	3,775	38,857	1,184	37,995	11,378	23,865	48,021	83,503	217,314	5,776		69,956	615,646

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Alabama, Mississippi	22,959	9,961	2,234	----	----	----	----	----	----	----	----	10,764	----	----	----	----	----	----	----	----	----	----	----	12,998
Arkansas	28,379	26,547										1,832												1,832
Louisiana	274,506	203,116	29,257	3,871	----	----	----	----	----	----	----	----	----	----	37	38,225	----	----	----	----	----	----	----	71,390
New Mexico	9,830	9,830			----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	
Texas	874,391	652,742	948	----	----	----	----	----	140	----	168,499	----	----	45,367	4,478	----	2,217	----	----	----	----	----	----	221,649
Total district 3	1,210,065	902,196	32,439	3,871	----	----	----	----	140	----	181,095	----	----	45,367	4,515	38,225	2,217	----	----	----	----	----	----	307,869
Colorado	13,224	1,338	----	----	----	----	----	----	----	----	----	1,045	66	180	----	----	----	----	----	----	----	----	----	10,595
Montana	26,410	9,382	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	17,028
Utah	30,050	6,948	----	----	15,544	----	----	----	----	----	----	----	----	85	----	----	----	----	----	----	----	----	----	23,102
Wyoming	38,736	36,982	----	----	1,647	----	----	----	----	----	----	95	12	----	----	----	----	----	----	----	----	----	----	1,754
Total district 4	108,420	54,650	----	----	17,191	----	----	----	----	----	----	1,140	78	265	----	----	----	----	----	----	----	----	----	53,770
California	331,507	299,785	----	7,058	----	----	----	----	----	----	----	----	----	5,559	----	----	19,105	----	----	----	----	----	----	31,722
Other States [1]	6,364	2,680	----	3,684	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	3,684
Total district 5	337,871	302,465	----	10,742	----	----	----	----	----	----	----	----	----	5,559	----	----	19,105	----	----	----	----	----	----	35,406
United States, total	2,755,574	1,543,192	51,109	5,388	10,742	36,180	2,445	49,560	3,775	38,997	3,191	296,260	20,029	24,802	99,212	93,451	343,696	27,068	1,405	105,052	1,212,382			
Daily average	7,550	4,228	140	14	30	99	7	135	11	107	8	812	55	68	272	256	942	74	4	288	3,322			

[1] Alaska, Hawaii, Oregon, and Washington.

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TABLE 29.—Crude runs to stills and refinery receipts of crude oil by origin of the crude and method of transportation by States and districts, 1963

(Thousands of barrels)

State and district	Crude runs to stills	Refinery fuel use and losses	Refinery receipts of domestic crude—								Refinery receipts of foreign crude	
			By State of origin of domestic crude	Change in refinery stocks	By receiving State and method of transportation							
					Intrastate			Interstate				
					Pipelines	Tank cars and trucks	Tankers and barges	Pipelines	Tank cars and trucks	Tankers and barges	Pipelines	Tankers and barges
Delaware, Massachusetts, Rhode Island	44,595	94	----------	−390	----------	----------	----------	----------	----------	9,102	----------	35,197
Florida, Georgia, South Carolina, Virginia	17,067	−2	570	+169	----------	----------	54	----------	409	2,289	----------	14,482
Maryland	6,249	−6	----------	−87	----------	----------	----------	----------	----------	105	----------	6,051
New Jersey	157,109	54	----------	−630	----------	----------	----------	----------	----------	61,568	----------	94,965
New York:												
East	8,524	----------	----------	+126	----------	----------	----------	----------	----------	----------	----------	8,650
West	19,543	----------	1,929	−15	----------	----------	----------	13,399	----------	----------	6,129	----------
Pennsylvania:												
East	183,457	165	----------	+1,441	----------	----------	----------	----------	----------	102,392	----------	82,671
West	15,631	1	6,048	−1	5,987	61	----------	8,402	207	974	----------	----------
West Virginia	2,444	----------	3,015	+10	1,547	63	----------	473	371	----------	----------	----------
Total district 1	[1] 454,619	306	11,562	+623	7,534	124	54	22,274	987	176,430	6,129	242,016
Illinois	215,117	−41	78,045	−33	28,392	93	----------	184,878	----------	1,505	175	----------
Indiana	153,265	9	4,868	−85	843	661	----------	151,501	124	----------	60	----------
Kansas	113,030	39	124,111	−433	82,929	2,185	----------	27,425	97	----------	----------	----------
Kentucky, Tennessee	40,621	−1	21,642	−571	5,427	233	14,828	----------	----------	19,561	----------	----------
Michigan	51,380	17	18,715	−9	17,846	458	----------	26,857	----------	----------	6,227	----------
Minnesota, Wisconsin	32,823	−26	----------	+580	----------	----------	----------	8,630	502	2,552	21,693	----------
Missouri	22,655	----------	----------	+92	----------	----------	----------	22,747	----------	----------	----------	----------
Nebraska	980	----------	17,014	−10	----------	----------	----------	970	----------	----------	----------	----------
North Dakota	16,128	12	[2] 23,767	−78	15,400	579	----------	----------	83	----------	----------	----------
Ohio:												
East	38,269	----------	----------	−20	3,466	606	69	32,108	----------	----------	----------	----------
West	109,482	----------	6,222	+187	----------	44	----------	102,417	----------	----------	6,283	[3] 925
Oklahoma	135,568	−50	195,561	+281	100,921	1,189	----------	33,689	----------	----------	----------	----------
Total district 2	927,318	−41	489,945	−99	255,224	6,048	14,897	591,222	806	23,618	34,438	925

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Alabama, Mississippi	23,178	—15	61,070	+359	6,517	2,147	1,297	10,304	211	2,483	----------	563
Arkansas	28,372	—24	31,935	+31	25,414	1,133	----------	1,774	58	----------	----------	----------
Louisiana	275,528	39	499,376	—1,061	154,152	2,955	46,009	69,414	176	1,800	----------	----------
New Mexico	9,944	4	109,042	—118	9,191	639	----------	----------	----------	----------	----------	----------
Texas	876,529	177	996,428	—2,038	607,535	9,023	36,184	129,649	12	91,988	[4] 102	175
Total district 3	1,213,551	181	1,697,851	—2,827	802,809	15,897	83,490	211,141	457	96,271	102	738
Colorado	13,322	6	37,518	—19	420	918	----------	11,706	180	----------	85	----------
Montana	28,056	5	29,411	—59	9,205	177	----------	16,993	35	----------	[5] 1,592	----------
Utah	30,104	—2	34,046	—52	6,869	79	----------	22,720	382	----------	----------	----------
Wyoming	40,691	6	142,034	—126	36,327	655	----------	95	1,659	----------	1,835	----------
Total district 4	112,173	15	243,009	—256	52,821	1,829	----------	51,514	2,256	----------	3,512	----------
California	395,090	230	303,225	—1,452	256,124	12,270	31,391	24,664	----------	7,058	----------	62,961
Alaska, Hawaii, Oregon, Washington	67,301	9	9,982	+662	2,680	----------	----------	----------	----------	3,684	46,071	15,537
Total district 5	462,991	239	313,207	—790	258,804	12,270	31,391	24,664	----------	10,742	46,071	78,498
United States, total	3,170,652	700	2,755,574	—3,349	1,377,192	36,168	129,832	900,815	4,506	307,061	[6] 90,252	322,177
Daily average	8,687	2	7,550	—9	[3] 3,773	99	356	2,468	12	842	247	883

[1] Includes 281,484 in Delaware River Valley.
[2] Includes 12 from South Dakota.
[3] Transhipped from PAD District 3.
[4] Tank cars and trucks.
[5] Icludes tank ncars and trucks, 25.
[6] Excludes crude oil imported for direct fuel use by pipelines.

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TABLE 30.—Daily average total demand for crude petroleum in the United States, 1962–63, by State of origin and months

(Thousand barrels)

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
1962:													
Alabama	17.8	24.3	20.1	21.3	17.1	12.4	11.3	21.9	30.5	26.7	25.6	25.5	21.2
Alaska	26.3	23.5	30.5	25.1	38.8	17.0	29.8	31.3	22.7	30.3	22.9	40.0	28.3
Arkansas	72.0	78.8	81.3	78.5	76.7	75.2	74.8	91.2	70.3	76.9	75.9	75.2	77.2
California	778.7	818.1	772.9	799.6	776.4	845.9	826.5	821.7	827.5	808.9	808.4	792.6	806.2
Colorado	115.6	121.1	102.1	119.0	119.3	120.2	121.8	101.7	117.9	119.9	106.5	106.3	114.2
Florida	.5	.4	3.2	1.0	----------	----------	3.3	.1	----------	----------	.6	3.0	1.0
Illinois	205.7	238.6	217.3	205.6	197.4	223.4	216.5	232.5	207.0	212.8	183.4	236.6	214.6
Indiana	32.8	30.7	38.8	30.4	35.5	30.7	31.1	36.5	33.0	31.3	35.1	30.1	33.0
Kansas	307.4	306.0	317.1	273.5	322.7	314.3	330.9	326.1	307.1	295.5	292.6	297.7	307.6
Kentucky	48.9	46.2	43.8	41.8	51.5	49.4	49.8	47.8	49.0	48.3	52.8	49.2	48.2
Louisiana	1,249.1	1,288.0	1,266.5	1,244.8	1,294.1	1,284.0	1,275.4	1,268.7	1,301.9	1,353.9	1,388.4	1,377.9	1,299.4
Michigan	50.3	48.8	48.0	45.2	43.0	52.2	42.7	48.4	45.9	44.1	49.8	47.8	47.3
Mississippi	138.6	147.9	155.5	149.6	160.7	149.7	161.6	163.5	135.7	162.5	164.7	151.7	152.7
Montana	60.7	107.6	79.8	86.8	68.4	90.7	78.1	92.5	92.1	80.2	90.5	92.4	84.7
Nebraska	79.9	65.7	67.3	64.1	69.7	71.2	62.4	73.6	63.5	72.5	61.2	72.6	68.7
New Mexico	294.6	335.1	296.6	305.0	326.3	318.3	296.4	264.5	337.1	252.7	295.4	295.5	301.0
New York	4.8	4.1	4.3	4.4	4.3	4.6	4.8	4.0	4.4	4.3	4.6	4.4	4.4
North Dakota	78.7	72.3	71.9	69.6	67.2	69.7	67.4	65.9	51.8	76.8	71.8	54.1	68.1
Ohio	17.1	16.0	16.2	15.9	15.6	16.5	16.2	14.7	19.6	13.3	15.5	16.8	16.1
Oklahoma	616.7	560.7	566.6	556.0	536.6	571.2	563.3	511.9	556.6	525.2	504.1	554.2	551.9
Pennsylvania	12.5	13.2	17.6	16.1	12.1	15.2	13.4	9.9	17.5	15.5	12.6	15.5	14.3
Texas	2,746.8	2,730.5	2,450.4	2,585.1	2,560.8	2,644.6	2,575.3	2,578.8	2,498.6	2,462.6	2,572.6	2,606.8	2,583.3
Utah	91.9	87.8	83.4	82.8	75.5	73.1	85.0	81.6	80.5	89.5	94.2	97.0	85.2
West Virginia	8.5	10.1	8.2	9.0	8.3	9.2	10.2	10.3	8.4	9.9	9.8	8.6	9.2
Wyoming	444.6	397.2	383.9	349.7	344.6	412.1	425.3	358.9	381.1	337.9	308.8	348.8	374.4
Other States	1.4	1.4	1.4	.9	1.0	1.0	1.1	1.0	1.1	1.1	1.1	1.0	[1] 1.2
Total domestic crude	7,501.9	7,574.1	7,144.7	7,180.8	7,223.6	7,471.8	7,374.4	7,258.0	7,260.8	7,152.6	7,238.9	7,401.3	7,313.4
Foreign crude	1,089.2	1,102.8	1,079.7	944.5	1,077.4	1,177.0	1,182.9	1,237.6	1,184.5	1,128.5	1,158.8	1,129.2	1,124.6
Grand total 1962	8,591.1	8,676.9	8,224.4	8,125.3	8,301.0	8,648.8	8,557.3	8,495.6	8,445.3	8,281.1	8,397.7	8,530.5	8,438.0
Pennsylvania grade (included above)	21.1	33.6	46.4	24.1	31.5	35.7	44.3	18.0	36.3	35.3	33.9	34.5	32.9

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1963:[1]													
Alabama	30.0	17.9	22.6	33.4	15.0	33.9	25.5	12.9	24.1	34.5	16.5	35.7	25.2
Alaska	37.3	19.8	32.4	21.5	32.0	26.0	21.9	47.4	26.5	33.0	27.8	36.0	30.2
Arkansas	67.5	78.2	77.2	70.6	79.6	75.5	67.5	82.9	79.4	76.0	75.4	74.0	75.3
California	800.9	781.5	843.7	782.3	793.1	821.8	866.5	833.2	868.0	832.7	847.3	833.0	825.7
Colorado	115.2	113.2	107.9	98.9	102.4	107.6	109.2	115.7	100.1	93.2	122.3	78.7	105.3
Florida	3.8			3.3		.7	3.0		1.0	2.7		2.9	1.5
Illinois	221.7	193.1	211.4	191.4	184.8	196.3	213.4	201.5	207.0	219.9	195.9	208.1	203.9
Indiana	29.6	29.0	32.1	33.1	34.6	35.4	32.1	31.8	28.7	32.2	26.3	32.6	31.5
Kansas	285.9	330.9	308.9	291.2	267.4	307.6	325.6	309.7	298.6	269.9	282.3	332.1	300.7
Kentucky	50.2	67.1	48.8	47.8	51.1	48.2	54.5	44.5	56.6	49.7	57.1	56.3	52.5
Louisiana	1,379.1	1,443.0	1,384.8	1,435.8	1,460.2	1,468.6	1,421.9	1,418.1	1,456.1	1,448.2	1,460.3	1,452.6	1,435.4
Michigan	44.5	42.9	44.6	42.6	44.3	45.7	46.0	42.7	43.5	43.5	39.1	43.8	43.6
Mississippi	146.6	175.1	149.2	167.9	165.7	170.1	149.6	164.9	163.7	162.7	167.6	156.4	161.5
Montana	95.4	83.7	92.4	76.4	86.5	91.2	98.4	88.5	90.0	79.8	81.2	90.3	87.9
Nebraska	60.5	63.0	61.6	50.8	56.5	74.9	60.4	49.8	66.7	59.2	58.2	54.4	59.6
New Mexico	310.0	305.3	317.3	302.7	287.9	325.1	293.5	279.2	287.0	293.3	314.6	284.8	300.0
New York	4.5	4.8	4.9	4.9	5.3	5.0	4.9	4.5	6.2	6.2	6.0	6.3	5.3
North Dakota	78.1	71.5	74.7	70.4	56.9	40.4	76.5	75.0	62.7	65.3	69.5	75.5	68.1
Ohio	15.0	13.3	14.6	13.1	14.1	16.0	15.1	18.1	14.6	12.0	26.2	32.3	17.1
Oklahoma	563.6	559.9	599.2	550.2	547.9	563.1	563.9	548.0	535.3	516.6	539.8	514.7	550.1
Pennsylvania	15.7	12.9	16.3	13.6	11.5	17.0	14.1	11.4	16.4	12.6	12.9	16.4	14.2
Texas	2,684.9	2,856.1	2,641.1	2,563.1	2,633.2	2,629.4	2,632.2	2,797.8	2,645.8	2,757.9	2,708.0	2,702.4	2,686.8
Utah	90.8	96.1	94.8	87.5	95.2	101.5	89.7	89.0	88.8	99.1	93.1	92.0	93.1
West Virginia	9.3	9.2	10.1	8.1	8.2	7.9	9.2	9.2	11.7	9.6	9.4	8.7	9.2
Wyoming	385.2	434.7	389.4	361.3	398.1	448.3	439.7	430.6	394.7	357.2	384.5	336.7	396.4
Other States	1.2	1.3	1.1	1.0	1.2	1.1	1.1	1.2	1.2	1.0	1.0	1.2	[3] 1.1
Total domestic crude	7,526.5	7,803.5	7,581.1	7,322.9	7,432.7	7,658.3	7,635.4	7,707.6	7,574.4	7,568.0	7,622.3	7,557.9	7,581.2
Foreign crude	1,191.7	1,201.7	1,119.7	1,027.0	1,106.2	1,153.5	1,185.0	1,143.4	1,123.0	1,067.4	1,101.4	1,157.8	1,131.2
Grand total 1963	8,718.2	9,005.2	8,700.8	8,349.9	8,538.9	8,811.8	8,820.4	8,851.0	8,697.4	8,635.4	8,723.7	8,715.7	8,712.4
Pennsylvania grade (included above)	36.8	34.7	33.1	31.9	30.6	36.2	33.2	30.7	39.4	33.2	33.6	37.3	34.2

[1] Arizona, 0.1; Missouri, 0.2; Nevada, 0.4; South Dakota, 0.5; Tennessee and Virginia were less than 0.05.
[2] Preliminary figures.
[3] Arizona, 0.2; Missouri, 0.1; Nevada, 0.3; South Dakota, 0.5; Tennessee and Virginia were less than 0.05.

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TABLE 31.—Total demand for crude petroleum in the United States, 1962–63, by States of origin and months

(Thousand barrels)

State	January	February	March	April	May	June	July	August	September	October	November	December	Total
1962:													
Alabama	551	680	624	639	531	371	350	680	914	828	767	790	7,725
Alaska	816	658	947	752	1,202	511	923	971	680	940	686	1,239	10,325
Arkansas	2,231	2,207	2,519	2,355	2,378	2,256	2,318	2,824	2,111	2,384	2,276	2,332	28,191
California	24,140	22,907	23,959	23,987	24,068	25,378	25,622	25,473	24,826	25,075	24,251	24,571	294,257
Colorado	3,583	3,391	3,165	3,569	3,699	3,606	3,775	3,153	3,537	3,716	3,194	3,296	41,684
Florida	17	12	100	31		1	101	3			18	92	375
Illinois	6,375	6,681	6,735	6,167	6,118	6,703	6,710	7,209	6,211	6,596	5,501	7,334	78,340
Indiana	1,018	860	1,202	913	1,100	921	965	1,132	991	970	1,053	933	12,058
Kansas	9,529	8,568	9,831	8,206	10,005	9,428	10,259	10,079	9,212	9,159	8,777	9,228	112,281
Kentucky	1,515	1,294	1,359	1,253	1,597	1,482	1,544	1,482	1,470	1,496	1,584	1,524	17,600
Louisiana	38,718	36,065	39,260	37,344	40,117	38,521	39,537	39,330	39,058	41,972	41,652	42,716	474,290
Michigan	1,560	1,367	1,487	1,357	1,332	1,566	1,324	1,499	1,377	1,368	1,494	1,482	17,213
Mississippi	4,297	4,141	4,822	4,488	4,983	4,492	5,011	5,068	4,071	5,036	4,642	4,702	55,753
Montana	1,882	3,012	2,473	2,603	2,120	2,722	2,421	2,869	2,762	2,486	2,714	2,865	30,929
Nebraska	2,478	1,839	2,086	1,924	2,161	2,136	1,934	2,282	1,904	2,249	1,835	2,250	25,078
New Mexico	9,134	9,382	9,194	9,149	10,114	9,549	9,189	8,200	10,113	7,833	8,863	9,160	109,880
New York	149	115	134	133	134	138	150	117	132	132	138	135	1,607
North Dakota	2,441	2,023	2,230	2,087	2,082	2,090	2,089	2,043	1,552	2,383	2,155	1,676	24,852
Ohio	531	446	503	476	483	494	502	456	589	412	466	520	5,878
Oklahoma	19,119	15,702	17,564	16,680	16,634	17,135	17,461	15,869	16,698	16,280	15,122	17,181	201,445
Pennsylvania	387	371	546	483	376	455	414	307	525	482	379	479	5,204
Texas	85,151	76,455	75,962	77,552	79,384	79,339	79,835	79,943	74,956	76,341	77,177	80,812	942,907
Utah	2,850	2,457	2,584	2,483	2,340	2,192	2,634	2,530	2,416	2,773	2,827	3,007	31,093
West Virginia	265	282	254	270	258	276	317	319	251	309	293	267	3,361
Wyoming	13,782	11,122	11,904	10,494	10,663	12,363	13,185	11,127	11,433	10,476	9,267	10,815	136,651
Other States	42	38	42	29	34	29	36	32	34	35	36	34	[1] 421
Total domestic crude	232,561	212,075	221,486	215,424	223,933	224,154	228,606	224,997	217,824	221,731	217,167	229,440	2,669,398
Foreign crude	33,764	30,878	33,470	28,335	33,400	35,311	36,670	38,366	35,534	34,984	34,765	35,006	410,483
Grand total 1962	266,325	242,953	254,956	243,759	257,333	259,465	265,276	263,363	253,358	256,715	251,932	264,446	3,079,881
Daily average:													
Domestic crude	7,502	7,574	7,145	7,181	7,224	7,472	7,374	7,258	7,261	7,153	7,239	7,401	7,313
Domestic and foreign crude	8,591	8,677	8,224	8,125	8,301	8,649	8,557	8,496	8,445	8,281	8,397	8,531	8,438
Pennsylvania grade (included above)	654	942	1,437	723	975	1,071	1,373	558	1,089	1,095	1,017	1,089	12,003

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1963: [2]													
Alabama	931	502	702	1,001	464	1,016	790	399	723	1,069	495	1,108	9,200
Alaska	1,155	555	1,003	645	993	779	680	1,469	792	1,022	834	1,115	11,042
Arkansas	2,092	2,188	2,392	2,117	2,469	2,266	2,091	2,569	2,381	2,356	2,262	2,295	27,478
California	24,828	21,881	26,155	23,468	24,586	24,656	26,861	25,830	26,041	25,815	25,419	25,824	301,364
Colorado	3,570	3,168	3,345	2,967	3,175	3,228	3,384	3,587	3,003	2,890	3,668	2,440	38,425
Florida	117			98		20	94		30	83		69	531
Illinois	6,872	5,408	6,556	5,742	5,729	5,888	6,616	6,247	6,209	6,819	5,878	6,451	74,415
Indiana	918	812	994	992	1,073	1,063	995	987	861	997	789	1,012	11,493
Kansas	8,864	9,267	9,575	8,735	8,290	9,229	10,095	9,599	8,959	8,366	8,469	10,295	109,743
Kentucky	1,556	1,878	1,513	1,433	1,583	1,445	1,689	1,379	1,697	1,540	1,714	1,744	19,171
Louisiana	42,751	40,405	42,928	43,074	45,265	44,058	44,078	43,962	43,683	44,894	43,808	45,032	523,938
Michigan	1,380	1,202	1,383	1,279	1,373	1,372	1,426	1,323	1,304	1,347	1,174	1,357	15,920
Mississippi	4,545	4,902	4,626	5,040	5,137	5,104	4,639	5,112	4,910	5,044	5,027	4,848	58,934
Montana	2,956	2,344	2,864	2,292	2,681	2,737	3,050	2,743	2,701	2,475	2,437	2,800	32,080
Nebraska	1,876	1,763	1,910	1,525	1,753	2,246	1,872	1,545	2,001	1,835	1,745	1,690	21,761
New Mexico	9,613	8,549	9,836	9,081	8,928	9,754	9,100	8,656	8,613	9,093	9,438	8,828	109,489
New York	139	135	151	147	164	149	150	141	186	193	180	194	1,929
North Dakota	2,422	2,002	2,315	2,111	1,764	1,212	2,371	2,326	1,882	2,024	2,085	2,339	24,853
Ohio	464	371	454	394	437	481	469	560	438	371	786	1,000	6,225
Oklahoma	17,471	15,677	18,575	16,506	16,986	16,891	17,482	16,988	16,059	16,017	16,195	15,956	200,803
Pennsylvania	486	362	505	407	355	511	438	354	491	390	386	509	5,194
Texas	83,230	79,971	81,875	76,893	81,628	78,881	81,598	86,732	79,374	85,494	81,241	83,775	980,692
Utah	2,815	2,692	2,939	2,624	2,952	3,046	2,781	2,759	2,665	3,068	2,794	2,850	33,985
West Virginia	289	256	313	244	253	238	284	284	352	297	282	270	3,362
Wyoming	11,945	12,172	12,072	10,842	12,342	13,447	13,632	13,350	11,840	11,074	11,535	10,438	144,689
Other States	37	36	35	33	35	33	33	35	37	33	29	37	[3] 413
Total domestic crude	233,322	218,498	235,016	219,690	230,415	229,750	236,698	238,936	227,232	234,606	228,670	234,296	2,767,129
Foreign crude	36,943	33,650	34,710	30,811	34,293	34,605	36,734	35,445	33,689	33,088	33,044	35,892	412,904
Grand total 1963	270,265	252,148	269,726	250,501	264,708	264,355	273,432	274,381	260,921	267,694	261,714	270,188	3,180,033
Daily average:													
Domestic crude	7,527	7,804	7,581	7,323	7,433	7,658	7,635	7,708	7,574	7,568	7,622	7,558	7,581
Domestic and foreign crude	8,718	9,005	8,701	8,350	8,539	8,812	8,820	8,851	8,697	8,635	8,724	8,716	8,713
Pennsylvania grade (included above)	1,142	972	1,026	956	948	1,085	1,029	951	1,181	1,029	1,008	1,155	12,482

[1] Arizona, 39; Missouri, 55; Nevada, 141; South Dakota, 169; Tennessee, 14; and Virginia, 3.
[2] Preliminary figures.
[3] Arizona, 55; Missouri, 54; Nevada, 96; South Dakota, 190; Tennessee, 15; and Virginia, 3.

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STOCKS

Refinery stocks of gasoline, kerosene, distillate fuel oil, residual fuel oil, liquefied refinery gas, miscellaneous oils, and unfinished oils are on a new basis for 1963. Petrochemical feedstocks, formerly included in these other categories, are now treated as a separate item. In some instances, where chemical plants were adjacent to refineries, stocks at the chemical plants were included with the refinery stocks. The new reporting now eliminates the chemical manufacture from the regular petroleum refining and furnishes better data on the products.

Stocks of all oils increased 1,263,000 barrels in 1963 and at the end of the year totaled 835,559,000 barrels. Stocks of refined products increased 13,551,000 barrels, natural gas liquids increased 2,362,000 barrels, while stocks of crude oil declined 14,650,000 barrels during the year.

TABLE 32.—Stocks of crude petroleum, natural gas liquids, and refined products in the United States at end of year

(Thousand barrels)

	1959	1960	1961	1962	1963
Crude petroleum:					
At refineries	69,305	66,450	64,644	64,836	61,487
Pipeline and tank farm	167,147	152,848	159,105	167,390	157,544
Producers	20,677	20,502	20,915	19,785	18,330
Total crude petroleum	257,129	239,800	244,664	252,011	237,361
Natural gas liquids	24,887	28,931	37,067	31,385	33,747
Refined products	526,954	515,827	543,343	[1] 550,900	564,451
Grand total	808,970	784,558	825,074	[1] 834,296	835,559

[1] New basis for comparison with 1963 due to product reclassification resulting from separately reported data for petrochemical feedstocks. Old-basis stock figures were 553,473,000 barrels for refined products and 836,869,000 barrels for total stocks of all oils.

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TABLE 33.—Stocks of crude petroleum in the United States by State of origin, by month: 1963

(Thousand barrels)

State of origin	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Alabama	306	182	428	539	312	550	321	256	625	689	407	648	281
Alaska	512	301	559	450	668	567	655	882	309	406	329	398	210
Arkansas	1,216	1,366	1,299	1,232	1,344	1,206	1,177	1,427	1,248	1,162	1,159	1,143	1,111
California	24,059	24,503	25,468	24,833	26,198	27,286	27,562	26,328	26,187	25,022	24,743	24,022	23,428
Colorado	3,448	3,232	3,192	3,245	3,513	3,607	3,569	3,394	2,950	2,969	3,262	2,574	3,294
Florida	128	44	76	120	61	103	124	69	109	115	72	111	61
Illinois	7,062	6,220	6,460	6,347	6,796	7,406	7,702	7,520	7,654	7,415	6,809	6,991	6,430
Indiana	379	302	274	318	390	403	308	314	419	436	390	430	303
Kansas	8,207	8,050	7,548	7,359	7,877	8,750	8,514	7,761	7,401	7,381	8,386	8,807	7,571
Kentucky	1,456	1,392	959	1,000	1,192	1,263	1,401	1,405	1,646	1,550	1,671	1,530	1,332
Louisiana	22,623	22,797	21,885	23,342	23,349	22,766	22,025	22,765	24,593	22,929	21,608	21,422	21,424
Michigan	976	940	1,004	969	1,052	1,041	990	964	923	916	929	1,040	1,029
Mississippi	2,533	2,885	2,555	2,934	2,699	2,537	2,531	2,376	2,228	2,381	2,590	2,299	2,351
Montana	4,735	4,388	4,474	4,276	4,541	4,486	4,265	3,807	3,706	3,549	3,681	3,731	3,530
Nebraska	2,050	1,977	1,956	1,942	2,281	2,415	1,984	2,011	2,329	2,099	2,079	2,041	2,064
New Mexico	9,875	9,204	9,051	8,516	8,352	8,561	7,718	7,835	8,596	9,147	9,516	9,332	9,999
New York	44	45	45	37	44	40	39	57	88	71	64	55	44
North Dakota	1,637	1,497	1,624	1,583	1,630	1,844	1,992	1,699	1,593	1,765	1,807	1,814	1,741
Ohio	651	600	658	690	782	829	798	811	706	717	813	755	597
Oklahoma	19,087	18,334	18,325	17,149	17,586	17,784	17,437	16,891	16,800	16,827	17,596	17,690	18,522
Pennsylvania	1,550	1,460	1,447	1,325	1,337	1,420	1,316	1,338	1,423	1,358	1,433	1,450	1,319
South Dakota	3	3	3										
Texas	107,044	102,568	97,866	97,866	100,991	101,951	103,135	105,120	102,341	103,495	101,595	100,146	99,449
Utah	3,056	3,066	3,029	3,056	3,270	3,205	2,952	3,015	3,095	3,171	2,879	2,770	2,542
West Virginia	890	847	848	808	864	914	933	940	933	851	846	814	771
Wyoming	15,895	16,317	15,426	15,796	17,183	17,462	16,051	14,960	13,937	13,393	14,154	14,456	15,613
Total domestic crude	239,422	232,520	226,459	225,732	234,312	238,396	235,499	233,945	231,839	229,814	228,818	226,469	225,016
Foreign crude located in Districts:													
Districts 1–4	8,997	10,854	9,705	10,730	11,602	11,676	9,981	10,465	10,888	11,830	11,296	11,862	8,811
District 5	3,592	5,835	4,232	4,567	5,477	5,594	4,556	5,552	6,350	6,617	5,425	6,056	3,534
Total foreign crude	12,589	16,689	13,937	15,297	17,079	17,270	14,537	16,017	17,238	18,447	16,721	17,918	12,345
Total crude stocks	252,011	249,209	240,396	241,029	251,391	255,666	250,036	249,962	249,077	248,261	245,539	244,387	237,361
Pennsylvania grade (included above)	2,783	2,609	2,532	2,475	2,560	2,688	2,573	2,626	2,704	2,544	2,605	2,559	2,335

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TABLE 34.—Stocks of crude petroleum in the United States by location, by month: 1963

(Thousand barrels)

State	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Alabama	236	294	302	263	168	185	203	157	125	116	208	284	222
Alaska	290	301	154	219	245	153	291	337	309	406	329	347	208
Arizona	448	448	448	448	448	447	447	449	448	448	447	448	449
Arkansas	1,656	1,730	1,750	1,689	1,683	1,654	1,621	1,883	1,682	1,591	1,611	1,573	1,544
California, Oregon, Washington	28,346	30,659	30,303	29,719	32,265	33,208	32,725	32,462	32,779	31,734	30,083	30,302	26,886
Colorado	1,462	1,493	1,685	1,431	1,762	1,731	1,710	1,592	1,363	1,420	1,566	1,411	1,452
Florida, Georgia, South Carolina, Virginia	512	685	705	852	905	1,020	868	741	920	684	945	974	701
Hawaii	235	431	519	628	586	831	489	679	470	798	748	559	272
Illinois	15,617	14,847	14,832	14,407	15,010	16,563	15,833	15,211	14,783	14,644	14,591	14,023	14,505
Indiana	4,340	4,472	4,094	3,981	4,415	4,206	4,048	4,019	4,345	3,987	4,144	4,394	3,842
Iowa, Missouri	6,480	6,714	6,440	6,496	6,840	6,564	6,878	6,674	6,570	6,379	6,442	6,532	6,559
Kansas	10,361	10,158	9,827	9,551	10,087	10,769	9,994	9,376	9,154	8,819	9,763	9,674	9,607
Kentucky, Tennessee	3,376	3,009	2,677	3,020	3,338	3,220	3,358	3,140	3,734	3,448	3,521	3,379	3,096
Louisiana	15,774	17,489	15,932	16,922	16,322	15,477	14,475	14,703	15,427	15,562	14,879	14,875	14,208
Maryland	326	389	330	402	284	470	474	590	585	743	484	360	239
Massachusetts, Delaware, Rhode Island	1,081	1,194	964	1,782	1,725	1,491	1,143	1,557	1,154	847	1,259	1,189	691
Michigan	1,936	1,983	2,150	2,115	2,014	1,862	1,927	2,064	1,854	1,843	1,893	1,900	1,809
Minnesota, Wisconsin	1,618	1,516	1,381	1,313	1,549	2,157	1,583	1,602	1,555	1,840	2,187	2,486	2,432
Mississippi	1,446	1,615	1,615	1,656	1,757	1,966	1,953	1,862	3,299	2,359	2,130	2,385	2,289
Montana	2,259	2,041	2,000	1,865	2,250	2,217	1,825	1,817	1,803	1,766	1,869	1,914	1,959
Nebraska	1,846	1,616	1,626	1,730	1,759	1,814	1,664	1,648	1,513	1,569	1,579	1,701	1,787
New Jersey	4,798	5,318	4,862	6,199	6,138	5,298	5,661	5,259	5,924	5,999	4,729	4,960	4,168
New Mexico	4,285	3,733	3,687	3,759	4,017	3,949	3,946	3,744	3,825	3,870	3,851	3,594	3,686
New York	975	808	933	694	1,098	1,039	1,114	1,162	1,049	890	850	966	1,115
North Dakota	1,205	1,297	1,326	1,327	1,195	1,194	1,412	1,243	1,252	1,319	1,217	1,216	1,189
Ohio	6,194	6,719	6,628	6,503	6,904	7,387	7,214	7,529	6,996	6,408	6,506	6,429	6,728
Oklahoma	21,087	19,197	17,636	16,525	16,776	19,629	16,813	17,030	17,419	17,995	19,250	20,034	20,778
Pennsylvania	8,448	8,205	9,384	9,800	9,899	10,713	9,367	9,171	9,163	9,844	10,386	10,275	9,498
South Dakota	3	3	3										
Texas	94,545	90,392	87,021	85,831	88,826	87,217	90,988	93,674	91,453	93,125	89,566	87,454	85,839
Utah	1,170	1,078	956	1,147	1,159	1,105	1,025	1,024	1,072	1,184	1,232	1,107	1,102
West Virginia	692	650	646	652	704	721	660	674	681	676	676	620	602
Wyoming	8,964	8,725	7,580	8,103	9,265	9,409	8,327	6,889	6,371	5,948	6,598	7,022	7,899
Total	252,011	249,209	240,396	241,029	251,391	255,666	250,036	249,962	249,077	248,261	245,539	244,387	237,361

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TABLE 35.—Stocks of crude petroleum in the United States by classification and location, by month: 1963

(Thousand barrels)

Classification and location	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
At refineries:													
Alabama	182	218	227	191	141	133	177	136	108	104	180	251	157
Alaska								88	79	47	78	71	46
Arkansas	382	433	465	492	478	464	412	590	494	462	434	426	413
California, Oregon, Washington	13,192	15,463	13,902	13,655	15,430	16,580	15,768	16,583	17,511	16,979	16,026	15,124	12,319
Colorado	249	276	373	294	461	345	362	336	256	245	268	174	230
Florida, Georgia, South Carolina, Virginia	493	641	629	830	842	917	838	672	811	652	873	863	662
Hawaii	235	431	519	628	586	831	489	679	470	798	748	559	272
Illinois	3,386	3,440	3,353	3,264	3,263	3,813	3,677	3,582	3,498	3,122	3,121	3,029	3,353
Indiana	1,400	1,650	1,575	1,224	1,227	1,198	1,281	1,110	1,197	1,106	1,484	1,528	1,315
Kansas	1,930	1,733	1,568	1,591	2,025	1,839	1,656	1,626	1,540	1,418	1,872	1,873	1,497
Kentucky, Tennessee	1,666	1,435	1,278	1,535	1,570	1,475	1,564	1,172	1,551	1,231	1,105	1,295	1,095
Louisiana	4,720	5,011	4,383	5,016	4,721	5,004	4,348	4,177	4,800	4,692	4,709	4,318	3,659
Maryland	326	389	330	402	284	470	474	590	585	743	484	360	239
Massachusetts, Delaware, Rhode Island	1,081	1,194	964	1,782	1,725	1,491	1,143	1,557	1,154	847	1,259	1,189	691
Michigan	824	831	980	929	868	1,074	906	917	864	907	898	901	815
Minnesota, Wisconsin	1,076	1,035	802	774	1,014	1,557	1,069	1,090	1,041	1,246	1,470	1,822	1,656
Mississippi	150	131	130	147	127	106	110	109	1,513	590	527	706	534
Missouri	96	165	158	327	286	217	249	226	209	202	204	229	188
Montana	576	448	436	402	673	589	384	379	364	340	520	501	517
Nebraska	39	44	41	43	37	33	42	27	37	37	30	28	29
New Jersey	4,798	5,318	4,862	6,199	6,138	5,298	5,661	5,259	5,924	5,999	4,729	4,960	4,168
New Mexico	335	279	318	308	325	317	299	262	175	159	201	210	217
New York	522	365	342	295	632	641	555	767	749	408	615	517	633
North Dakota	288	266	312	279	182	171	360	221	221	254	255	215	210
Ohio	1,811	2,019	1,839	1,919	2,313	2,155	2,193	2,310	1,995	1,628	1,472	1,492	1,978
Oklahoma	1,981	1,714	1,831	1,886	2,048	1,786	2,083	1,854	1,811	2,111	2,343	2,291	2,262
Pennsylvania	6,399	6,315	7,549	8,097	8,230	8,738	7,639	7,403	7,472	8,244	8,538	8,421	7,839
Texas	15,452	15,042	16,581	16,231	16,834	15,979	17,201	16,507	15,908	15,887	14,942	13,705	13,414
Utah	474	378	380	421	475	430	456	396	432	439	425	476	422
West Virginia	37	52	59	43	57	51	42	52	53	54	57	36	47
Wyoming	736	635	677	570	710	730	653	506	493	472	660	594	610
Total at refineries	64,836	67,351	66,863	69,774	73,702	74,432	72,091	71,183	73,315	71,423	70,527	68,164	61,487

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TABLE 35.—Stocks of crude petroleum in the United States by classification and location, by month: 1963—Continued

(Thousand barrels)

Classification and location	Jan. 1	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Pipeline and tank-farm stocks:													
Alabama	43	64	65	62	16	39	14	2	3	2	17	23	52
Alaska	288	298	151	216	242	146	286	245	227	356	250	273	159
Arkansas	961	969	962	1,091	1,097	1,084	1,103	1,174	1,077	1,012	1,074	1,038	1,028
California, Arizona	12,123	12,158	13,387	13,037	13,783	13,381	13,882	12,993	12,209	11,898	12,304	13,393	12,706
Colorado	1,083	1,102	1,207	1,030	1,194	1,279	1,241	1,149	1,000	1,068	1,191	1,122	1,123
Florida	11	36	68	12	55	96	24	63	101	19	64	104	32
Illinois	11,742	10,918	10,990	10,639	11,272	12,290	11,684	11,172	10,838	11,074	11,042	10,555	10,705
Indiana	2,910	2,792	2,489	2,727	3,158	2,978	2,730	2,879	3,118	2,851	2,630	2,836	2,497
Iowa, Missouri	6,384	6,549	6,282	6,169	6,554	6,347	6,629	6,448	6,361	6,177	6,238	6,303	6,371
Kansas	7,850	7,865	7,724	7,400	7,517	8,385	7,772	7,214	7,078	6,865	7,378	7,256	7,550
Kentucky, Tennessee	1,645	1,509	1,334	1,420	1,703	1,680	1,729	1,903	2,118	2,152	2,351	2,019	1,936
Louisiana	8,802	10,056	9,337	9,854	9,549	8,392	8,073	8,555	8,594	8,712	8,157	8,383	8,297
Michigan	942	982	995	1,011	976	618	851	977	812	766	825	820	824
Minnesota, Wisconsin	542	481	579	539	535	600	514	512	514	594	717	664	776
Mississippi	901	1,024	1,030	1,064	1,190	1,433	1,404	1,330	1,391	1,369	1,247	1,289	1,402
Montana	1,343	1,238	1,209	1,093	1,207	1,276	1,089	1,103	1,104	1,091	1,014	1,078	1,095
Nebraska	1,682	1,447	1,470	1,572	1,613	1,672	1,513	1,512	1,367	1,423	1,440	1,564	1,649
New Mexico	2,853	2,337	2,252	2,369	2,610	2,550	2,540	2,375	2,575	2,615	2,570	2,280	2,390
New York	423	413	561	369	436	368	529	365	270	452	205	419	452
North Dakota	730	795	817	817	796	822	812	807	830	868	780	812	798
Ohio	4,303	4,620	4,709	4,504	4,511	5,152	4,941	5,139	4,921	4,700	4,954	4,857	4,670
Oklahoma	17,654	16,016	14,378	13,162	13,222	16,365	13,239	13,739	14,158	14,434	15,475	16,323	17,065
Pennsylvania	1,899	1,740	1,685	1,553	1,519	1,825	1,578	1,618	1,541	1,450	1,698	1,704	1,509
Texas	71,404	67,596	62,716	61,761	64,266	63,656	66,067	69,436	67,995	69,464	66,938	65,982	64,672
Utah	649	639	525	660	628	610	514	572	571	695	752	583	613
West Virginia	490	433	422	444	482	505	453	457	463	457	454	419	390
Wyoming	7,733	7,575	6,388	7,008	8,051	8,184	7,171	5,896	5,378	4,976	5,445	5,935	6,783
Total pipeline and tank-farm stocks	167,390	161,652	153,732	151,583	158,182	161,733	158,382	159,635	156,614	157,540	157,210	158,034	157,544
Lease stocks	19,785	20,206	19,801	19,672	19,507	19,501	19,563	19,144	19,148	19,298	17,802	18,189	18,330
Total stocks:													
1963	252,011	249,209	240,396	241,029	251,391	255,666	250,036	249,962	249,077	248,261	245,539	244,387	237,361
1962	244,664	242,444	240,166	245,632	255,859	255,676	247,740	242,418	243,588	244,226	251,719	256,284	252,011

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STORAGE CAPACITY

The Bureau of Mines conducts semiannual surveys of petroleum refineries, bulk terminals, and underground storage facilities to ascertain the capacity assigned to the storage of gasoline, kerosine, distillate fuel oil, residual fuel oil, military jet fuel, and liquefied petroleum gases. Liquefied gases require special storage facilities the bulk being underground caverns. Tanks for storing residual fuel oil can also be used for crude oil. Storage for the other products is interchangeable depending on demand.

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TABLE 36.—Capacity of storage tanks for finished petroleum products and capacity of underground storage facilities for liquefied gases, at refineries, gasoline plants, bulk terminals [1] and tank farms

(Thousand barrels)

Refinery district and date	Gasoline			Kerosine			Distillate fuel oil			Residual fuel oil			Military jet fuel			Liquefied petroleum gases			
																Aboveground		Underground	
	At refineries	At bulk terminals	Total	At refineries	At bulk terminals	Total	At refineries	At bulk terminals	Total	At refineries	At bulk terminals	Total	At refineries	At bulk terminals	Total	At plants and terminals	At refineries	At plants, terminals and refineries	Total
1962:																			
East Coast:																			
Apr. 1	25,899	59,011	84,910	3,644	18,575	22,219	20,234	68,533	88,767	7,247	16,674	23,921	828	623	1,451	[2] 101	[2] 336	[2] 1,920	[2] 2,357
Oct. 1	23,062	56,739	79,801	4,560	18,282	22,842	22,951	70,285	93,236	7,369	17,909	25,278	574	451	1,025	[2] 101	[2] 226	[2] 1,920	[2] 2,247
Appalachian No. 1:																			
Apr. 1	2,677	6,597	9,274	281	907	1,188	1,323	4,166	5,489	546	428	974	40	-------	40	(3)	(3)	(3)	(3)
Oct. 1	2,599	6,560	9,159	256	982	1,238	1,566	4,206	5,772	533	246	779	70	-------	70	(3)	(3)	(3)	(3)
Appalachian No. 2:																			
Apr. 1	1,568	4,144	5,712	143	561	704	462	2,218	2,680	518	67	585	27	169	196	(3)	(3)	(3)	(3)
Oct. 1	1,315	4,235	5,550	329	639	968	631	2,342	2,973	399	67	466	27	169	196	(3)	(3)	(3)	(3)
Indiana, Illinois, Kentucky, etc.:																			
Apr. 1	41,159	27,577	68,736	5,594	4,780	10,374	20,588	19,114	39,702	9,408	963	10,371	1,634	596	2,230	[3] 466	[3] 625	[3] 4,213	[3] 5,304
Oct. 1	36,209	25,727	61,936	6,358	4,851	11,209	23,898	19,589	43,487	10,224	1,268	11,492	1,706	692	2,398	[3] 466	[3] 700	[3] 4,348	[3] 5,514
Minnesota, Wisconsin, North and South Dakota:																			
Apr. 1	4,011	9,568	13,579	607	1,434	2,041	2,965	9,893	12,858	1,568	183	1,751	203	68	271	(4)	(4)	(4)	(4)
Oct. 1	3,776	9,410	13,186	778	1,486	2,264	2,406	10,934	13,340	1,584	183	1,767	213	63	276	(4)	(4)	(4)	(4)
Oklahoma, Kansas, Missouri, etc.:																			
Apr. 1	20,600	14,027	34,627	1,194	867	2,061	9,803	8,419	18,222	2,696	21	2,717	1,668	488	2,156	[4] 701	[4] 512	[4] 6,538	[4] 7,751
Oct. 1	17,662	12,920	31,582	1,540	941	2,481	11,618	9,665	21,283	2,252	21	2,273	1,592	326	1,918	[4] 712	[4] 733	[4] 8,412	[4] 9,857
Texas Inland:																			
Apr. 1	9,813	5,288	15,101	655	774	1,429	3,516	1,236	4,752	1,093	-------	1,093	1,081	360	1,441	1,920	[5] 186	13,786	15,892
Oct. 1	9,254	5,150	14,404	650	789	1,439	3,630	1,166	4,796	1,056	-------	1,056	1,147	439	1,586	1,930	[5] 214	14,942	17,086
Texas Gulf Coast:																			
Apr. 1	48,061	6,291	54,352	5,901	1,130	7,031	19,771	3,682	23,453	9,043	286	9,329	2,731	-------	2,731	792	991	24,728	26,511
Oct. 1	42,190	5,527	47,717	5,650	1,138	6,788	24,009	4,001	28,010	8,954	236	9,190	3,006	-------	3,006	781	868	26,640	28,289

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Louisiana Gulf Coast:																						
Apr. 1	18,293	3,675	21,968	2,822	757	3,579	7,064	1,655	8,720	1,689	534	2,223	1,673	-------	1,573	235	[2] 283	6,247	6,785
Oct. 1	16,789	3,656	20,445	2,887	754	3,641	9,731	1,696	11,427	1,766	532	2,296	1,849	-------	1,849	251	[2] 297	6,403	6,951
Arkansas, Louisiana Inland, etc.:																						
Apr. 1	2,291	7,270	9,561	327	717	1,044	1,058	2,071	3,129	308	-----	308	108	400	508	215	(1)	4,320	4,535
Oct. 1	2,278	7,317	9,595	314	771	1,085	942	2,307	3,249	289	-----	289	118	265	383	232	(1)	4,394	4,626
New Mexico:																						
Apr. 1	686	432	1,118	56	43	99	124	161	285	230	-----	230	193	60	253	236	(1)	1,528	1,764
Oct. 1	517	427	944	66	42	110	121	161	282	226	-----	226	193	60	253	233	(1)	1,271	1,504
Rocky Mountain:																						
Apr. 1	9,945	2,808	12,753	582	177	759	3,554	1,746	5,300	2,489	2	2,491	869	163	1,032	238	96	274	608
Oct. 1	9,169	2,803	11,972	825	182	1,007	4,171	1,783	5,954	2,376	2	2,378	857	123	980	192	96	274	562
West Coast:																						
Apr. 1	39,706	15,626	55,334	2,610	1,625	4,235	18,473	11,139	29,612	17,310	12,519	29,829	3,320	245	3,565	108	606	976	1,692
Oct. 1	37,462	16,736	54,198	2,877	2,089	4,966	18,257	11,272	29,529	16,423	12,735	29,158	3,203	277	3,480	108	820	976	1,904
United States:																						
Apr. 1	224,711	162,314	387,025	24,416	32,347	56,763	108,955	134,033	242,988	54,145	31,677	85,822	14,275	3,172	17,447	5,012	3,637	64,530	73,179
Oct. 1	203,282	157,207	360,489	27,092	32,946	60,038	123,981	139,407	263,388	53,451	33,199	86,650	14,555	2,865	17,420	5,006	3,954	69,380	78,540

See footnotes at end of table.

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TABLE 36.—Capacity of storage tanks for finished petroleum products and capacity of underground storage facilities for liquefied gases, at refineries, gasoline plants, bulk terminals [1] and tank farms—Continued

(Thousand barrels)

Refinery district and date	Gasoline			Kerosine			Distillate fuel oil			Residual fuel oil			Military jet fuel			Liquefied petroleum gases			
																Aboveground		Underground	
	At refineries	At bulk terminals	Total	At refineries	At bulk terminals	Total	At refineries	At bulk terminals	Total	At refineries	At bulk terminals	Total	At refineries	At bulk terminals	Total	At plants and terminals	At refineries	At plants, terminals and refineries	Total
1963:																			
East Coast:																			
Apr. 1	25,750	59,522	85,272	3,816	18,988	22,804	21,755	71,280	93,035	7,259	17,738	24,997	476	665	1,141	[2] 329	[2] 252	[2] 1,982	[2] 2,563
Oct. 1	22,572	58,441	81,013	4,078	19,372	23,450	25,096	73,712	98,808	7,847	17,372	25,219	470	432	902	[2] 329	[2] 231	[2] 2,157	[2] 2,717
Appalachian No. 1:																			
Apr. 1	2,734	6,597	9,331	280	967	1,247	1,334	4,368	5,702	564	393	957	40	-------	40	(3)	(3)	(3)	(3)
Oct. 1	2,327	6,317	8,644	282	952	1,234	1,414	4,012	5,426	535	226	761	87	-------	87	(3)	(3)	(3)	(3)
Appalachian No. 2:																			
Apr. 1	1,517	4,539	6,056	209	693	902	487	2,225	2,712	404	67	471	27	169	196	(3)	(3)	(3)	(3)
Oct. 1	1,311	4,592	5,903	261	758	1,019	598	2,361	2,959	464	67	531	27	169	196	(3)	(3)	(3)	(3)
Indiana, Illinois, Kentucky, etc.:																			
Apr. 1	40,366	27,282	67,648	5,421	4,987	10,408	19,019	20,270	39,289	9,334	1,703	11,037	1,613	697	2,310	[2] 471	[2] 787	[2] 4,712	[2] 5,970
Oct. 1	35,585	26,572	62,157	6,325	5,264	11,589	26,119	20,044	46,163	10,213	1,252	11,465	1,420	611	2,031	[2] 495	[2] 754	[2] 4,385	[2] 5,634
Minnesota, Wisconsin, North and South Dakota:																			
Apr. 1	3,950	10,365	14,315	586	2,193	2,779	2,245	9,870	12,115	1,164	327	1,491	202	63	265	(4)	(4)	(4)	(4)
Oct. 1	3,832	9,725	13,557	825	2,362	3,187	2,435	10,328	12,763	1,139	185	1,324	258	41	299	(4)	(4)	(4)	(4)
Oklahoma, Kansas, Missouri, etc.:																			
Apr. 1	19,154	13,346	32,500	1,386	1,008	2,394	10,797	8,648	19,445	1,952	21	1,973	1,441	361	1,802	[4] 695	[4] 711	[4] 10,168	[4] 11,574
Oct. 1	18,047	12,828	30,875	1,986	1,046	3,032	11,597	9,357	20,954	1,875	21	1,896	1,387	321	1,708	[4] 749	[4] 722	[4] 11,623	[4] 13,094
Texas Inland:																			
Apr. 1	11,195	5,316	16,511	653	792	1,445	3,001	1,156	4,157	1,051	-------	1,051	1,126	404	1,530	2,105	[5] 674	14,684	17,463
Oct. 1	10,978	5,593	16,571	632	813	1,445	3,386	1,233	4,619	1,011	-------	1,011	1,049	356	1,405	1,964	[5] 670	14,426	17,060
Texas Gulf Coast:																			
Apr. 1	43,359	6,906	50,265	5,689	809	6,498	21,537	3,070	24,607	7,162	236	7,398	3,457	-------	3,457	628	971	27,791	29,390
Oct. 1	41,232	6,247	47,479	6,205	1,267	7,472	25,465	3,696	29,161	7,367	236	7,603	2,943	-------	2,943	641	961	27,383	28,985

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Louisiana Gulf Coast:																				
Apr. 1	18,041	3,726	21,767	2,717	726	3,443	7,281	1,639	8,920	1,138	550	1,688	1,845	------	1,845	320	[4] 324	6,849	7,493
Oct. 1	18,459	3,657	22,116	3,568	732	4,300	9,846	1,569	11,415	2,290	366	2,656	1,947	------	1,947	388	[4] 394	6,494	7,266
Arkansas, Louisiana Inland, etc.:																				
Apr. 1	2,260	7,747	9,997	329	813	1,142	1,090	1,922	3,012	300	10	310	120	265	385	232	(5)	4,642	4,874
Oct. 1	2,726	7,584	10,310	464	878	1,342	961	2,142	3,123	321	------	321	127	345	472	212	(5)	4,511	4,723
New Mexico:																				
Apr. 1	515	437	952	67	42	109	128	161	289	230	------	230	137	60	197	229	(5)	1,274	1,503
Oct. 1	526	436	962	68	42	110	129	160	289	41	------	41	193	60	253	246	(5)	1,263	1,509
Rocky Mountain:																				
Apr. 1	9,646	2,683	12,329	476	182	658	3,560	1,645	5,205	1,892	2	1,894	960	93	1,053	201	95	274	570
Oct. 1	9,288	2,612	11,900	780	117	897	3,909	1,685	5,594	1,903	2	1,905	970	135	1,105	216	98	319	633
West Coast:																				
Apr. 1	40,047	17,095	57,142	3,654	1,957	5,611	18,273	11,832	30,105	17,915	12,718	30,633	2,689	119	2,808	96	922	850	1,868
Oct. 1	40,050	17,049	57,099	3,487	1,977	5,464	18,942	11,497	30,439	17,996	12,479	30,475	3,649	168	3,817	80	784	850	1,714
United States:																				
Apr. 1	218,524	165,561	384,085	25,283	34,157	59,440	110,507	138,086	248,593	50,365	33,765	84,130	14,133	2,896	17,029	5,306	4,736	73,226	83,268
Oct. 1	206,963	161,653	368,616	28,961	35,680	64,541	128,917	141,796	271,713	53,002	32,206	85,208	14,627	2,638	17,165	5,320	4,614	73,401	83,335

[1] Includes only bulk terminals operated by refinery and pipeline companies.
[2] Figures for Appalachian No. 1 included with those for East Coast.
[3] Figures for Appalachian No. 2 included with those for Indiana, Illinois, etc.
[4] Figures for Minnesota, Wisconsin, etc., included with those for Oklahoma, Kansas, etc.
[5] Figures for New Mexico included with those for Texas Inland.
[6] Figures for Arkansas, Louisiana Inland, etc., included with those for Louisiana Gulf.

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VALUE AND PRICE

The total value of crude oil produced in the United States in 1963 was $7,966,651,000, which is an average wellhead price $2.89 per barrel. The price at the well in 1962 was $2.90.

Several of the changes in posted prices for crude oil in 1963 were the result of establishing prices on the bases of the gravity of the oil. Some of the States affected by this change were Texas, New Mexico, Louisiana, Oklahoma, Indiana, Illinois, and Kentucky.

TABLE 37.—Value of crude petroleum at wells in the United States, by States

State	1962		1963 [1]	
	Total value at wells (thousand dollars)	Average value per barrel	Total value at wells (thousand dollars)	Average value per barrel
Alabama	19,355	$2.59	23,763	$2.59
Alaska	31,187	3.04	32,650	3.04
Arkansas	73,546	2.66	72,812	2.66
California	741,475	2.50	745,818	2.48
Colorado	122,334	2.88	110,220	2.88
Illinois	234,812	2.98	219,873	2.98
Indiana	35,989	2.98	33,794	2.96
Kansas	326,141	2.91	317,501	2.91
Kentucky	52,478	2.95	55,617	2.92
Louisiana:				
Gulf Coast	1,357,155	3.15	1,464,740	3.13
Northern	145,413	3.14	167,052	3.05
Total Louisiana	1,502,568	3.15	1,631,792	3.12
Michigan	48,775	2.85	45,523	2.85
Mississippi	154,882	2.78	162,156	2.76
Montana	76,690	2.42	75,335	2.44
Nebraska	70,450	2.83	61,623	2.83
New Mexico:				
Southeastern	285,612	2.90	289,565	2.90
Northwestern	29,271	2.70	26,067	2.67
Total New Mexico	314,883	2.88	315,632	2.88
New York	7,309	4.60	8,854	4.59
North Dakota	69,248	2.75	68,133	2.73
Ohio	18,089	3.10	19,439	3.15
Oklahoma	591,977	2.92	582,693	2.91
Pennsylvania	24,230	4.57	22,631	4.56
Texas: [2]				
Gulf Coast	584,078	3.26	607,097	3.25
East Texas Proper	135,870	3.10	131,940	3.10
West Texas	1,203,399	2.88	1,246,269	2.87
Other districts	895,362	2.96	908,684	2.95
Total Texas	2,818,709	2.99	2,893,990	2.97
Utah	85,019	2.74	91,041	2.72
West Virginia	13,880	4.00	12,940	3.99
Wyoming	338,259	2.49	361,018	2.50
Other States [3]	1,766	2.10	1,803	2.06
Total United States	7,774,051	2.90	7,966,651	2.89

[1] Preliminary figures.
[2] Texas Railroad Commission divisions.
[3] Arizona, Florida, Missouri, Nevada, South Dakota, Tennessee, and Virginia.

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TABLE 38.—Posted price per barrel of petroleum at wells in the United States in 1963, by grade, with data of change

Date	Pennsylvania grade		Corning grade	Western Kentucky	Indiana-Illinois	Cold-water, Mich.	Oklahoma-Kansas	
	Bradford and Allegheny districts	In southwest Pennsylvania					34°–34.9°	36°–36.9°
Jan. 1	4.63	4.08	2.72	3.00	3.00	2.80	2.91	2.97
Oct. 1				[1]	[1]			
Oct. 11			2.67					

Date	Panhandle, Texas (Carson, Gray, Hutchinson, and Wheeler Counties), 35°–36.9°	West Texas, 30°–30.9° (sweet)	Lea County, N. Mex., 30°–30.9°	South Texas, Mirando, 24°–24.9°	East Texas	Gulf Coast			
						Conroe, Tex.	Texas		Louisiana, 30°–30.9°
							30°–30.9°	20°–20.9°	
Jan. 1	2.80	2.81	2.65	3.23	3.10	3.35	3.10	2.90	3.10
July 12				3.05					

Date	Caddo-Pine Island, La., 36°–36.9°	Magnolia-Smackover, Limestone, Ark., 31°–31.9°	Elk Basin, Wyo. (incl. Montana), 30°–30.9°	California			
				Coalinga, 32°–32.9°	Kettleman Hills, 37°–37.9°	Midway Sunset, 19°–19.9°	Wilmington, 24°–24.9°
Jan. 1	2.97	2.67	2.63	2.96	3.21	2.29	2.60
June 1							2.58

[1] Now priced on a gravity basis.

Source: Platt's Oil Price Handbook.

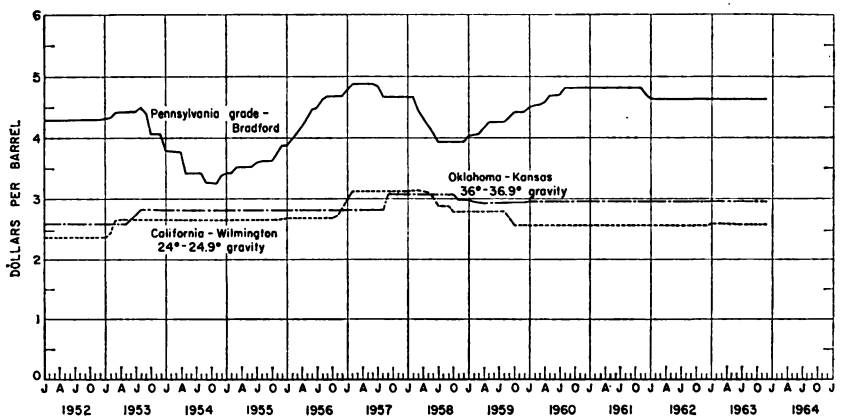

FIGURE 5.—Posted prices of selected grades of crude petroleum in the United States, 1952–63, by months.

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REFINED PRODUCTS

GENERAL REVIEW

Petroleum is consumed in many finished products that must be considered individually. Competition with other fuels and economic and climatic conditions influence the consumption.

Gasoline is consumed principally in highway transport, aviation, and mechanized farming. The demand for kerosine (a product defined as meeting lamp-oil specifications for color and flashpoint) has changed drastically within the past few years. This product was losing sales to electricity and liquefied petroleum, especially in rural areas, but the ability of the commercial jet aircraft to use straight kerosine as fuel has opened a vast new market. Distillate fuel oil, including light diesel oils, is used for space heating and for diesel locomotive fuel, and has nearly replaced residual fuel oil and coal in railroad use. Residual fuel oil usually sells for less than crude oil at the refineries and competes directly with natural gas and coal for heavy-fuel uses. As it is not normally moved by pipeline, its distribution depends on cheap water transport and limited tankcar movement. Therefore, it cannot normally compete with coal in coal-producing areas. Liquefied gases, in competition with kerosine and light distillate fuel oil in domestic use, are gaining in importance as fuel in internal-combustion engines and as the initial raw material in synthesizing many petrochemicals.

The total demand for all oils in 1963 averaged 10,768,000 barrels daily, including a domestic demand of 10,560,000 barrels and exports which averaged 208,000 barrels daily. On a percentage basis, total demand increased 3.5 percent; domestic demand, 3.2 percent; and exports, 23.8 percent.

Military purchases from domestic sources in 1963 averaged 442,000 barrels daily compared with 475,000 barrels daily in 1962.

The new supply of refined products comprises the refinery input of crude oil, the production of natural gas liquids, a small quantity of motor benzol derived from coal, and imports of refined products from foreign countries. The new supply exceeded demand in 1963 and resulted in an increase of 13,551,000 barrels in stocks of refined products.

Because of separating the petrochemical feedstocks from the other products, some of the individual products yields for 1963 are not comparable with previous years. The continuing decline in the residual fuel oil yield and the increase in the refinery shortage (excess of refinery output over input) reflect the trend in the petroleum industry to install more hydrocracking and coking facilities to obtain higher yields of the lighter end products.

According to the Bureau of Labor Statistics, the wholesale price index for refined products in 1963 was 97.2 compared with 98.2 in 1962. The average wholesale price for the four principal products—gasoline, kerosine, distillate fuel oil, and residual fuel oil—was 9.01 cents per gallon compared with 9.13 cents in 1962.

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TABLE 39.—Salient statistics of the major refined petroleum products in the United States

(Thousand barrels)

	1959	1960	1961	1962	1963 [1]
Gasoline and naphtha:					
Production, total	1,488,860	1,522,497	1,534,462	1,583,376	1,627,975
From crude	1,320,107	1,343,341	1,344,819	1,387,706	1,413,081
From natural gas liquids	168,429	178,881	189,474	195,579	214,814
Benzol, etc., blended	324	275	169	91	80
Imports	13,358	9,790	10,685	13,878	16,145
Exports	16,743	13,456	8,976	6,592	6,939
Stocks, end of year (old basis)	187,613	194,774	184,167	190,138	
Stocks, end of year (new basis) [2]				188,683	190,937
Domestic demand	1,485,277	1,511,670	1,533,173	1,584,691	1,634,927
Kerosine:					
Production, total	111,530	136,842	142,690	157,379	165,846
From crude	110,662	135,772	141,410	156,373	164,705
From natural gas liquids	868	1,070	1,280	1,006	1,141
Imports	114	68	2,964	6,417	8,642
Exports	944	689	231	337	558
Stocks, end of year (old basis)	26,856	31,445	32,433	31,725	
Stocks, end of year (new basis) [2]				32,398	34,102
Domestic demand	109,919	132,499	144,435	164,167	[3] 172,226
Distillate fuel oil:					
Production, total	679,641	668,684	696,622	720,087	764,953
From crude	678,938	667,050	696,015	719,590	764,483
From natural gas liquids	703	1,634	607	497	470
Crude used directly as distillate	970	1,001	851	1,198	807
Imports	17,658	12,771	17,377	11,831	9,149
Exports	12,734	9,897	6,931	8,224	14,972
Stocks, end of year (old basis)	151,164	138,455	152,018	144,505	
Stocks, end of year (new basis) [2]				143,961	156,677
Domestic demand	659,983	685,268	694,356	732,405	747,221
Residual fuel oil:					
Production	347,900	332,147	315,577	295,679	276,766
Crude used directly as residual	7,386	3,948	3,854	3,797	3,305
Imports	222,571	233,208	243,268	264,314	274,314
Exports	20,815	18,495	14,022	12,850	15,281
Stocks, end of year (old basis)	53,501	44,870	44,869	49,996	
Stocks, end of year (new basis) [2]				49,775	47,538
Domestic demand	563,464	559,439	548,678	545,813	541,341
Military jet fuel:					
Production, total	93,691	89,109	95,923	102,974	99,360
JP-4 grade [4]	[5]	[5]	[5]	[5]	82,189
JP-5 grade					11,441
Other military grades					4,730
Imports	13,572	12,372	10,045	10,897	16,290
Exports	173	113	122	82	193
Stocks, end of year	8,758	6,870	8,280	9,668	8,544
Domestic demand	104,228	102,803	104,436	112,401	116,581
Lubricants:					
Production	56,111	59,389	59,254	61,467	63,086
Imports		22	14	28	23
Exports, total	13,972	15,811	17,094	17,693	18,341
Grease	392	393	363	400	383
Oil	13,580	15,418	16,731	17,293	17,958
Stocks, end of year	8,950	12,303	12,943	13,130	14,321
Domestic demand	42,878	42,676	41,534	43,615	43,577
Wax (1 barrel =280 pounds):					
Production	5,630	5,896	5,781	5,353	5,126
Imports	21	6	2		4
Exports	1,031	1,333	1,237	1,429	1,454
Stocks, end of year	774	905	1,061	1,020	886
Domestic demand	4,558	4,438	4,390	3,965	3,810
Coke (5 barrels =1 short ton):					
Production, total	41,117	60,010	75,333	78,724	80,628
Marketable coke	23,395	26,057	30,480	31,624	32,428
Catalyst coke	17,722	33,953	44,853	47,100	48,200
Exports	4,680	6,856	7,270	7,456	10,761
Stocks, end of year	5,705	4,387	5,316	5,880	6,483
Domestic demand	35,550	54,472	67,134	70,704	69,264

See footnotes at end of table.

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TABLE 39.—Salient statistics of the major refined petroleum products in the United States—Continued

	1959	1960	1961	1962	1963 [1]
Asphalt (5.5 barrels=1 short ton):					
Production	97,643	98,671	101,819	109,576	111,948
Imports (including natural)	6,869	6,143	6,609	6,625	6,158
Exports	935	924	667	826	717
Stocks, end of year	10,948	12,991	12,999	14,252	14,354
Domestic demand	102,386	104,696	107,753	114,122	117,287
Road oil:					
Production	6,493	5,970	5,820	7,079	6,792
Stocks, end of year	653	743	761	875	753
Domestic demand	6,257	5,880	5,802	6,965	6,914
Still gas: Production	126,958	129,480	127,537	130,829	129,518
Liquefied gases (incl. ethane):					
Production [6]	68,692	77,578	78,947	76,826	56,394
Transfers of liquefied gas [7] from natural gasoline	146,415	152,173	159,371	178,733	178,892
Imports	([8])	1,631	1,806	2,248	2,495
Exports	2,252	2,988	3,541	2,874	4,593
Stocks, end of year (old basis)	2,520	3,623	6,298	4,769	
Stocks, end of year (new basis) [2]				3,916	3,346
Domestic demand	212,542	227,291	233,908	255,462	233,758
Petrochemical feedstocks: [9]					
Production				([5])	91,356
Stocks, end of year (old basis)	([5])	([5])	([5])	([5])	([5])
Stocks, end of year (new basis) [2]				3,530	3,130
Domestic demand, total				([5])	91,756
Still gas					7,834
L.R.G.	([5])	([5])	([5])	([5])	39,276
Naphtha—400°					22,022
Other					22,624
Miscellaneous:					
Production, total	23,303	25,852	28,375	31,661	16,400
From crude	21,854	24,358	26,267	29,794	13,578
From natural gas liquids	1,449	1,494	2,108	1,867	2,822
Imports	4	47			
Exports	262	257	245	237	239
Stocks, end of year (old basis)	2,281	2,846	2,832	3,366	
Stocks, end of year (new basis) [2]				1,831	1,631
Domestic demand	23,173	25,208	28,144	30,890	16,361
Other unfinished oils:					
Rerun (net)	25,868	22,094	21,202	27,733	31,934
Imports	23,072	16,478	25,348	32,516	31,702
Stocks, end of year (old basis)	67,231	61,615	79,366	84,149	
Stocks, end of year (new basis)				81,981	81,749
Shortage or (overage)	(31,509)	(53,282)	(65,429)	(63,901)	(73,620)

[1] Preliminary figures.
[2] New basis. These data are comparable to 1963 due to product reclassification resulting from separately reporting data for petrochemical feedstocks.
[3] Sales of commercial jet fuel: PAD Districts I–IV, 54,390,000 barrels; District V, 20,703,000 barrels.
[4] Includes military jet fuel produced at natural gas liquid plants: 615,000 barrels.
[5] Not available.
[6] Liquefied refinery gases (L–R-gases).
[7] Liquefied petroleum gases (L–P-gases).
[8] Included with imports of gasoline.
[9] Produced at petroleum refineries.

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TABLE 40.—Input and output of petroleum products at refineries in the United States

(Thousand barrels)

	1959	1960	1961	1962	1963 [1]
Input:					
Crude petroleum:					
Domestic	2,565,504	2,581,568	2,604,127	2,659,826	2,758,168
Foreign	352,157	370,966	383,031	409,805	412,484
Total crude petroleum	2,917,661	2,952,534	2,987,158	3,069,631	3,170,652
Natural gas liquids	152,999	166,518	169,278	182,756	190,143
Benzol	324	275	169	91	80
Total input	3,070,984	3,119,327	3,156,605	3,252,478	3,360,875
Output:					
Gasoline [2]	1,473,430	1,510,134	1,514,266	1,570,553	1,603,304
Kerosine [2]	110,662	135,772	141,410	156,373	164,705
Distillate fuel oil [2]	678,938	667,050	696,015	719,590	764,483
Residual fuel oil	347,900	332,147	315,577	295,679	276,766
Military jet fuel [3]	92,933	88,248	95,210	102,269	98,745
Lubricants	56,111	59,389	59,254	61,467	63,086
Wax [4]	5,630	5,896	5,781	5,353	5,126
Coke [4]	41,117	60,010	75,333	78,724	80,628
Asphalt [4]	97,643	98,671	101,819	109,576	111,948
Road oil	6,493	5,970	5,820	7,079	6,792
Still gas	126,958	129,480	127,537	130,829	129,518
Liquefied gases	68,692	77,578	78,947	76,826	56,394
Petrochemical feedstocks	([5])	([5])	([5])	([5])	91,356
Other finished products [3]	21,854	24,358	26,267	29,794	13,578
Other unfinished oils (net) [6]	−25,868	−22,094	[2] −21,202	[2] −27,733	[2] −31,934
Shortage (or overage) [7]	−31,509	−53,282	−65,429	−63,901	−73,620
Total output	3,070,984	3,119,327	3,156,605	3,252,478	3,360,875

[1] Preliminary figures.
[2] For 1959 and 1960, figures for unfinished gasoline are included in those for gasoline. For 1961–1963, figures for unfinished gasoline are included in those for unfinished oils.
[3] Production at natural-gasoline plants shown as direct "transfers" and omitted from the input and output at refineries.
[4] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton.
[5] Not available. Formerly included with gasoline, kerosine, distillate fuel oil, residual fuel oil, liquefied petroleum gases, miscellaneous oils, and unfinished oils.
[6] Negative quantity; represents net excess of unfinished oil reruns over unfinished oil produced.
[7] Includes losses or gains in volume during processing.

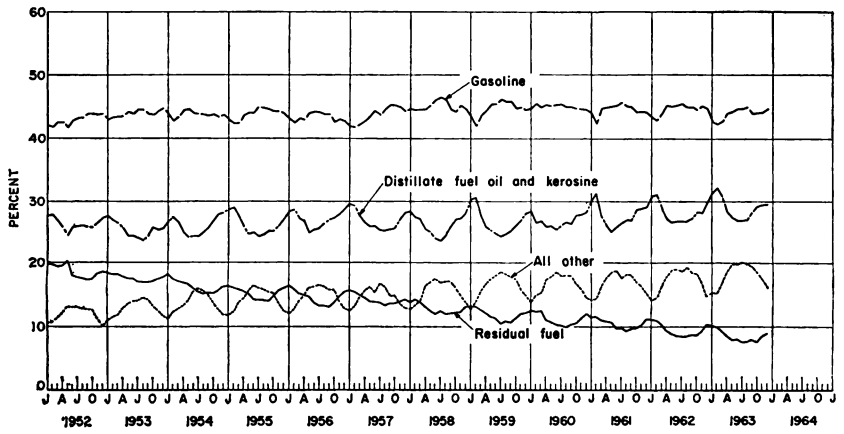

FIGURE 6.—Yields of principal products from crude runs to stills in the United States, 1952–63, by months.

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TABLE 41.—Percentage yields of refined petroleum products from crude oil in the United States [1]

Product	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963 [2]
Finished products:										
Gasoline	43.8	44.0	43.4	43.8	45.2	44.9	45.2	44.7	44.8	44.1
Kerosine	4.8	4.3	4.2	3.8	3.9	3.8	4.6	4.7	5.0	5.1
Distillate fuel oil	21.3	22.0	22.9	23.1	22.4	23.1	22.4	23.1	23.2	23.9
Residual fuel oil	16.4	15.3	14.7	14.4	12.9	11.8	11.2	10.5	9.6	8.6
Military jet fuel	1.8	2.1	2.3	2.2	2.6	3.2	3.0	3.1	3.3	3.1
Lubricating oil	2.1	2.0	2.0	1.9	1.8	1.9	2.0	2.0	2.0	2.0
Wax	.2	.2	.2	.2	.2	.2	.2	.2	.1	.1
Coke	1.0	1.0	1.1	1.2	1.3	1.4	2.0	2.5	2.6	2.6
Asphalt	2.9	3.0	3.1	3.0	3.2	3.3	3.3	3.4	3.5	3.5
Road oil	.3	.3	.3	.2	.2	.2	.2	.2	.2	.2
Still gas	4.0	4.3	4.2	4.3	4.4	4.3	4.4	4.2	4.3	4.0
Liquefied gases	1.3	1.6	1.8	1.9	2.0	2.3	2.6	2.7	2.5	1.8
Petrochemical feed stocks	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	2.8
Other finished products	.4	.4	.4	.5	.7	.7	.8	.8	.9	.4
Shortage	−.3	−.5	−.6	−.5	−.8	−1.1	−1.9	−2.1	−2.0	−2.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[1] Other unfinished oils added to crude in computing yields.
[2] Preliminary figures.
[3] Not available. Included with gasoline, kerosine, distillate fuel oil, residual fuel oil, liquefied petroleum gases, and miscellaneous and unfinished oils.

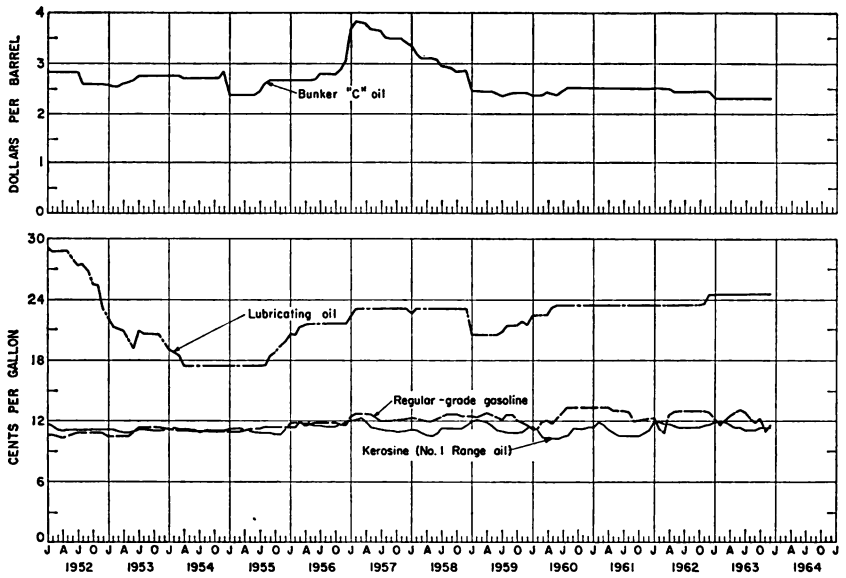
DOLLARS PER BARREL
Bunker "C" oil
CENTS PER GALLON
Lubricating oil
Regular-grade gasoline
Kerosine (No. 1 Range oil)
J A J O J A J O J A J O J A J O J A J O J A J O J A J O J A J O J A J O J A J O J A J O J
1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964

FIGURE 7.—Prices of Bunker "C" oil at New York Harbor, bright stock at Oklahoma refineries, No. 1/Range oil at Chicago district, and regular-grade gasoline at refineries in Oklahoma, 1952–63, by months.

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TABLE 42.—Stocks of refined petroleum products in the United States at end of month

(Thousand barrels)

Product	January	February	March	April	May	June	July	August	September	October	November	December	December [1]
1962:													
Gasoline [2]	195,592	205,745	205,963	200,425	192,366	185,534	183,067	173,022	179,896	176,408	175,415	190,138	188,683
Kerosine	26,386	25,295	23,315	24,248	27,264	30,112	33,204	35,682	36,682	37,333	35,349	31,725	32,398
Distillate fuel oil	121,041	99,952	86,497	88,310	102,317	121,496	140,630	163,025	176,192	185,222	170,221	144,505	143,961
Residual fuel oil	41,605	39,457	37,127	39,267	40,976	44,891	50,662	54,085	56,513	54,077	51,154	49,996	49,775
Military jet fuel	8,092	8,057	8,317	8,505	8,251	8,162	8,055	8,656	8,405	9,413	10,768	9,668	9,668
Lubricating oil	13,133	13,391	13,631	13,282	12,672	12,463	12,490	12,176	12,180	12,598	12,546	13,130	13,130
Wax	1,043	960	927	911	919	863	986	987	986	978	951	1,020	1,020
Coke	5,312	5,265	5,356	5,153	5,072	5,059	5,240	5,052	5,219	5,186	5,398	5,880	5,880
Asphalt	14,665	16,554	19,030	20,788	21,294	19,918	18,417	14,432	13,579	11,377	11,603	14,252	14,252
Road oil	807	1,065	1,439	1,498	1,557	1,574	1,235	1,003	988	815	815	875	875
Liquefied refinery gases	5,530	5,272	4,999	5,210	5,925	6,348	6,428	6,251	6,351	5,864	5,483	4,769	3,916
Petrochemical feedstocks	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	3,530
Miscellaneous	3,070	2,808	3,218	3,213	3,168	3,133	3,386	3,358	3,370	3,646	3,416	3,366	1,831
Other unfinished oils	79,412	80,860	78,396	84,378	85,662	87,896	84,751	85,798	83,524	85,534	87,491	84,149	81,981
Total 1962	515,688	504,681	488,215	495,188	507,443	527,449	548,551	563,527	583,885	588,451	570,610	553,473	550,900
1963: [4]													
Gasoline [2]	201,005	209,396	214,717	204,787	195,706	192,629	184,712	177,714	181,283	178,265	181,257	190,937	----------
Kerosine	26,103	23,789	23,216	27,344	29,578	32,285	35,246	36,214	35,978	39,118	39,131	34,102	----------
Distillate fuel oil	111,674	87,812	83,913	91,718	103,160	123,364	145,239	164,917	177,231	191,394	192,561	156,677	----------
Residual fuel oil	46,896	43,627	42,867	44,685	46,648	48,100	50,885	52,456	52,624	54,359	52,250	47,538	----------
Military jet fuel	9,774	8,979	9,792	9,287	9,628	10,180	10,245	9,619	9,310	8,589	8,912	8,544	----------
Lubricating oil	13,343	13,783	14,147	13,678	13,240	13,380	13,447	13,450	13,815	13,435	14,035	14,321	----------
Wax	1,032	1,004	918	881	859	911	885	908	903	877	860	886	----------
Coke	5,954	6,020	6,003	5,905	5,692	5,643	5,786	5,762	5,857	5,973	6,906	6,483	----------
Asphalt	16,316	18,228	20,729	23,850	20,948	19,850	16,814	14,495	12,779	10,366	11,874	14,354	----------
Road oil	969	1,028	1,318	1,630	1,698	1,687	1,424	1,170	942	851	780	753	----------
Liquefied refinery gases	2,824	2,172	2,642	2,967	3,707	4,089	4,477	4,677	4,922	4,860	4,568	3,346	----------
Petrochemical feedstocks	3,016	2,852	2,900	3,432	3,611	3,785	3,793	3,719	3,595	3,457	3,134	3,130	----------
Miscellaneous	2,086	1,744	1,693	1,675	1,529	1,597	1,689	1,682	1,575	1,404	1,427	1,631	----------
Other unfinished oils	78,772	79,216	81,190	85,137	90,355	90,443	89,294	86,793	83,744	85,361	86,287	81,749	----------
Total 1963	519,764	499,650	506,045	516,976	526,359	547,943	563,936	573,576	584,558	598,309	603,982	564,451	----------

[1] New basis for comparison with 1963 due to product reclassification resulting from separately reported data for petrochemical feedstocks.
[2] Excludes unfinished gasoline which is considered as unfinished oils.
[3] Included in various other products, separate data not available.
[4] Preliminary figures.

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TABLE 43.—Input and output of petroleum products at refineries in the United States, by months

(Thousand barrels)

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1962:													
Input:													
Crude petroleum	265,277	241,965	253,988	242,961	256,283	258,782	264,437	262,528	252,663	256,073	251,025	263,649	3,069,631
Natural gas liquids	15,288	13,493	14,409	13,616	14,743	14,482	15,308	15,603	15,716	16,801	16,474	16,823	182,756
Benzol	9	5	4	10	6	4	3	4	10	12	13	11	91
Total input	280,574	255,463	268,401	256,587	271,032	273,268	279,748	278,135	268,389	272,886	267,512	280,483	3,252,478
Output:													
Gasoline [1]	131,820	118,204	128,804	122,265	131,170	132,138	138,781	135,520	132,075	131,722	130,014	138,040	1,570,553
Kerosine [2]	14,507	14,664	12,726	11,051	11,359	11,458	13,243	12,516	12,319	13,436	13,606	15,488	156,373
Distillate fuel oil [3]	68,406	61,151	62,080	54,323	57,503	58,464	59,312	58,951	58,136	59,249	57,311	64,704	719,590
Residual fuel oil	30,371	26,543	26,862	22,897	23,312	22,219	23,208	22,893	23,139	22,490	23,584	28,161	295,679
Military jet fuel [3]	7,564	7,072	8,621	8,628	9,191	8,954	8,360	9,661	8,783	9,406	9,181	6,848	102,269
Lubricating oil	5,019	4,727	4,962	5,262	5,026	5,081	5,293	5,046	5,329	5,324	4,971	5,427	61,467
Wax [3]	430	393	490	427	499	423	490	469	427	458	412	435	5,353
Coke [3]	6,597	6,092	6,692	5,852	6,687	6,959	6,694	6,847	6,511	6,617	6,335	6,841	78,724
Asphalt [3]	4,779	5,079	6,955	8,493	11,277	11,668	12,683	12,731	11,826	10,393	7,580	6,112	109,576
Road oil	124	306	623	410	707	1,046	1,077	1,184	727	395	257	223	7,079
Still gas	10,523	9,523	10,771	10,261	11,321	11,542	11,985	11,598	11,060	11,117	10,293	10,835	130,829
Liquified refinery gases	6,535	6,008	6,699	6,292	6,672	6,461	6,688	6,256	6,208	6,047	6,107	6,853	76,826
Miscellaneous [3]	2,304	1,992	2,522	2,422	2,594	2,536	2,746	2,580	2,434	2,796	2,593	2,275	29,794
Other unfinished oils (net)	◂ −2,693	◂ −1,049	◂ −5,196	3,307	◂ −1,355	◂ −463	◂ −5,524	◂ −3,087	◂ −4,991	◂ −1,042	514	◂ −6,154	◂ −27,733
Shortage or (overage)	(5,712)	(5,242)	(5,210)	(5,303)	(4,931)	(5,218)	(5,288)	(5,030)	(5,594)	(5,522)	(5,246)	(5,605)	(63,901)
Total output	280,574	255,463	268,401	256,587	271,032	273,268	279,748	278,135	268,389	272,886	267,512	280,483	3,252,478

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1963: [5]													
Input:													
Crude petroleum	269,438	251,422	268,992	249,716	263,936	263,589	272,664	273,532	260,206	266,884	261,001	269,272	3,170,652
Natural gas liquids	16,607	14,343	15,300	15,263	15,350	14,738	14,786	15,884	16,235	17,432	16,673	17,532	190,143
Benzol	7	6	7	10	7	6	7	7	6	7	5	5	80
Total input	286,052	265,771	284,299	264,989	279,293	278,333	287,457	289,423	276,447	284,323	277,679	286,809	3,360,875
Output:													
Gasoline [1]	134,280	121,760	131,053	124,957	131,597	134,356	139,450	141,670	133,362	136,130	133,204	141,485	1,603,304
Kerosene [2]	15,567	14,943	14,428	13,461	11,840	11,610	12,834	12,445	12,163	14,709	14,659	16,046	164,705
Distillate fuel oil [2]	70,790	66,598	68,407	57,234	60,155	60,073	62,819	63,309	63,117	63,824	62,858	65,799	764,483
Residual fuel oil	28,169	25,334	25,406	21,481	21,000	21,811	21,748	21,795	21,521	21,031	22,501	24,969	276,766
Military jet fuel [2]	7,631	7,032	8,312	8,141	8,527	8,874	9,055	8,836	8,450	7,822	8,322	7,743	98,745
Lubricating oil	5,110	4,844	5,122	5,206	5,478	5,252	5,570	5,422	5,367	5,433	5,314	4,968	63,086
Wax [3]	379	386	420	437	440	473	404	461	447	443	384	452	5,126
Coke [3]	6,574	6,182	6,683	6,478	6,505	6,598	7,037	6,925	6,748	6,835	6,776	7,287	80,628
Asphalt [3]	4,954	4,588	6,520	8,603	11,056	12,100	12,878	13,182	12,360	11,286	8,182	6,239	111,948
Road oil	214	185	448	678	663	1,061	1,271	1,008	584	438	132	110	6,792
Still gas	10,216	9,591	10,527	10,368	11,020	11,376	12,015	11,690	10,821	10,561	10,512	10,821	129,518
Liquefied refinery gases	4,628	4,359	4,903	4,758	5,043	4,931	5,041	4,878	4,447	4,176	4,202	5,028	56,394
Petrochemical feedstocks	6,064	5,979	7,771	7,313	7,897	8,045	7,899	8,100	7,603	8,241	7,638	8,806	91,356
Miscellaneous [2]	1,182	976	1,149	979	1,085	1,177	1,244	1,212	1,180	1,163	1,110	1,121	13,578
Other unfinished oils (net)	[4] −5,409	[4] −1,714	[4] −405	1,033	2,729	[4] −2,798	[4] −4,720	[4] −5,186	[4] −5,671	[4] −1,389	[4] −1,742	[4] −6,662	[4] −31,934
Shortage or (overage)	(4,297)	(5,272)	(6,445)	(6,138)	(5,742)	(6,606)	(6,588)	(6,324)	(6,052)	(6,380)	(6,373)	(7,403)	(73,620)
Total output	286,052	265,771	284,299	264,989	279,293	278,333	287,457	289,423	276,447	284,323	277,679	286,809	3,360,875

[1] Includes natural gas liquids, naphtha and benzol blended at refineries.
[2] Production at natural gasoline plants shown as direct transfers and omitted from the input and output at refineries.
[3] Conversion factor: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton.
[4] Negative quantity; represents net excess of unfinished oils rerun over unfinished oils produced.
[5] Preliminary figures.

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TABLE 44.—Input and output of petroleum products at refineries in the United States, by districts

(Thousand barrels)

	East Coast	Appalachian No. 1	Appalachian No. 2	Indiana, Illinois, Kentucky, etc.	Minnesota, Wisconsin, etc.	Oklahoma, Kansas, etc.	Texas Inland	Texas Gulf Coast	Louisiana Gulf Coast	Arkansas-Louisiana-Inland, etc.	New Mexico	Rocky Mountain	West Coast	Total
1962:														
Input:														
Crude petroleum	406,223	36,723	35,047	546,649	46,636	270,683	112,979	724,841	270,470	42,153	9,433	110,980	456,814	3,069,631
Natural-gas liquids	2,492	78	140	14,087	1,227	18,790	25,063	63,443	20,060	8,053	1,509	3,920	23,894	182,756
Benzol	65			13								13		91
Total input	408,780	36,801	35,187	560,749	47,863	289,473	138,042	788,284	290,530	50,206	10,942	114,913	480,708	3,252,478
Output:														
Gasoline [1]	187,933	15,305	18,225	278,855	22,833	154,056	81,396	379,681	141,612	24,491	5,416	52,402	208,348	1,570,553
Kerosine [2]	13,636	1,278	2,276	30,515	2,081	7,005	4,294	43,664	24,742	1,967	228	2,220	17,467	156,373
Distillate fuel oil [2]	121,213	8,523	6,302	117,200	10,941	65,980	19,785	192,861	63,910	9,371	1,575	24,531	77,398	719,590
Residual fuel oil	53,451	3,759	3,576	51,211	6,266	7,271	5,851	36,609	15,341	1,958	781	14,197	95,408	295,679
Military jet fuel [3]	3,237	375	335	11,247	1,556	13,981	12,915	18,115	11,987	973	1,443	5,809	19,296	102,269
Lubricating oil	7,029	3,278	427	4,639		4,829	156	24,276	7,230	1,950		312	6,441	61,467
Wax [3]	1,886	283	79	365		601	70	1,030	505			85	449	5,353
Coke [3]	12,846	130	442	16,094	1,751	8,477	1,898	16,322	5,392	2,114	51	2,704	10,503	78,724
Asphalt [3]	25,794	1,502	2,725	20,345	1,411	11,199	4,974	7,115	6,118	5,387	559	6,212	16,235	109,576
Road oil	37		7	1,865	155	1,810		15	4	4		1,919	1,263	7,079
Still gas	15,922	1,837	1,829	26,208	1,554	10,831	4,733	26,118	9,131	2,080	284	4,047	26,155	130,829
Liquefied refinery gases	10,212	601	214	8,125	655	6,601	3,144	21,276	13,299	800	274	1,568	10,057	76,826
Miscellaneous [3]	3,947	675	52	3,981	66	1,330	859	7,419	5,547	179		158	5,081	29,794
Other unfinished oils (net)	[4] −37,958	[4] −659	[4] −845	2,183	[4] −213	[4] −564	[4] −2,445	23,262	[4] −2,631	[4] −534	53	186	[4] −7,568	[4] −27,733
Shortage or (overage)	(11,305)	(86)	(457)	(12,184)	(1,193)	(4,434)	(588)	(14,479)	(11,657)	(534)	278	(1,437)	(5,825)	(63,901)
Total output	408,780	36,801	35,187	560,749	47,863	289,473	138,042	788,284	290,530	50,206	10,942	114,913	480,708	3,252,478

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1963: [5]														
Input:														
Crude petroleum	417,001	37,618	36,269	569,865	48,951	272,233	112,934	763,595	283,098	43,980	9,944	112,173	462,991	3,170,652
Natural-gas liquids	3,890	54	881	16,107	1,492	19,213	24,771	70,659	16,026	7,557	1,468	4,127	23,898	190,143
Benzol	24			18								38		80
Total input	420,915	37,672	37,150	585,990	50,443	291,446	137,705	834,254	299,124	51,537	11,412	116,338	486,889	3,360,875
Output:														
Gasoline [1]	202,296	15,669	18,920	292,632	24,447	154,622	78,671	377,480	136,965	24,626	5,837	54,444	216,695	1,603,304
Kerosine [2]	14,993	1,337	1,976	33,012	1,997	5,269	4,509	53,362	25,942	1,729	167	2,304	18,108	164,705
Distillate fuel oil [2]	129,264	9,108	7,310	123,297	11,220	68,465	19,448	208,686	74,098	9,966	1,597	24,545	77,479	764,483
Residual fuel oil	41,165	3,882	3,431	51,295	6,209	6,124	4,642	35,744	14,378	2,205	671	13,614	93,406	276,766
Military jet fuel [2]	2,573	318	189	11,290	1,940	13,261	12,160	16,475	12,428	1,077	1,564	5,789	19,681	98,745
Lubricating oil	7,960	3,315	413	5,316		5,050	158	25,334	7,712	1,916		364	5,548	63,086
Wax [3]	1,662	383	81	344		516	85	1,032	471			82	470	5,126
Coke [3]	13,408	148	568	16,438	2,001	7,760	2,015	17,057	6,382	2,087	47	2,548	10,169	80,628
Asphalt [3]	26,115	1,668	3,185	21,346	1,582	10,961	5,475	7,786	5,371	5,577	602	6,535	15,745	111,948
Road oil	26		9	1,838	108	1,717		15	1			1,905	1,173	6,792
Still gas	17,048	1,838	1,833	24,911	1,303	11,255	5,821	26,120	8,159	2,001	283	3,658	25,288	129,518
Liquefied refinery gases	9,890	681	430	10,268	1,059	7,520	2,710	7,842	5,547	960	301	1,633	7,553	56,394
Petrochemical feedstocks	5,773	311		6,989		733	1,562	52,379	15,054	877	104	280	7,294	91,356
Miscellaneous [3]	1,863	231	50	1,234	73	1,716	2,136	3,335	121	24		280	2,515	13,578
Other unfinished oils (net)	[4] −40,458	[4] −899	[4] −652	769	[4] −142	1,446	[4] −1,114	21,531	[4] −4,584	[4] −845	[4] −21	[4] −407	[4] −6,558	[4] −31,934
Shortage or (overage)	−12,663	−318	−593	−14,989	−1,354	−4,969	−573	−19,924	−8,921	−663	260	−1,236	−7,677	−73,620
Total output	420,915	37,672	37,150	585,990	50,443	291,446	137,705	834,254	299,124	51,537	11,412	116,338	486,889	3,360,875

[1] Includes natural gas liquids, naphtha and benzol blended at refineries.
[2] Production at natural gasoline plants shown as direct transfers and omitted from the input and output at refineries.
[3] Conversion factors: 280 pounds of wax to the barrel; 5.0 barrels of coke to the short ton; 5.5 barrels of asphalt to the short ton.
[4] Negative quantity; represents net excess of unfinished oils rerun over unfinished oils produced.
[5] Preliminary figures.

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REFINERY CAPACITY

On January 1, 1964, there were 304 petroleum refineries in the United States with a total installed crude-oil throughput capacity of 10,385,374 barrels per calendar day. Compared with last year, this represents a decrease of 4 in the number of refineries and an increase 267,053 barrels daily in total capacity. At the beginning of 1964, 2.4 percent of the total operable capacity was shut down compared with 2.0 percent a year ago. The one new plant reported to be under construction at the beginning of 1964 is located in Nevada.

The operating ratio of the petroleum refining industry at the beginning of 1964 as indicated by the ratio of January 1964 crude runs to the total operable capacity was 85.6 percent. This compares with an 86.9 percent at the beginning of 1963.

TABLE 45.—Petroleum refinery capacity in the United States, Jan. 1

Year	Number of refineries				Crude-oil throughput capacity (barrels per day)				
	Operating	Shutdown	Total	Building	Operating	Shutdown		Total	Building
						Operable	Inoperable		
1959	291	22	313	----	9,450,741	310,705	58,400	9,819,846	108,400
1960	290	20	310	2	9,543,329	299,295	58,800	9,901,424	70,947
1961	289	22	311	----	9,629,685	368,888	11,500	10,010,073	36,500
1962	287	24	311	1	9,812,248	220,799	72,100	10,105,147	110,350
1963	287	21	308	2	9,814,791	196,130	107,400	10,118,321	178,300
1964	282	22	304	1	10,063,164	242,610	79,600	10,385,374	54,700

AVIATION GASOLINE

Due to a sharp decline in deliveries to the military, the total demand for aviation gasoline was 3.4 percent less than in 1963. Alkylate production increased over 5 million barrels and was used mainly in the production of automotive gasoline.

Jet-type fuels are not included in aviation gasoline. The fuel used in commercial jetplanes (mostly straight kerosine) is reported in another section of the chapter under "Kerosine" and that used by the military is reported under the section on "Jet fuel."

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TABLE 46.—Salient statistics of aviation gasoline in the United States in 1963,[1] by months and year 1962

(Thousand barrels)

Item	1963													1962 total
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
Production:														
By grades:														
Military 115–145	1,575	1,351	1,276	1,133	1,613	1,006	1,295	1,482	1,217	1,404	1,838	1,957	17,147	22,959
Military 100–130	42	28	25	40	26	25	29	22	30	32	21	4	324	769
Commercial 115–145	1,157	1,237	1,729	1,817	1,311	1,584	1,660	1,517	1,232	1,228	1,271	2,017	17,760	14,563
Commercial 100–130	1,170	638	894	935	992	889	701	1,129	951	1,063	1,282	875	11,519	11,504
91–98	69	18	48	21	40	55	15	41	42	57	44	14	464	758
Other grades (including commercial 108–135)	241	112	204	388	231	353	385	336	443	321	327	283	3,624	3,558
Alkylate (net)[2]	5,304	5,744	6,479	6,212	6,994	6,984	6,881	6,667	5,608	5,890	4,988	5,607	73,358	68,159
Total	9,558	9,128	10,655	10,546	11,207	10,896	10,966	11,194	9,523	9,995	9,771	10,757	124,196	122,270
Transfers out:[3]														
Alkylate	4,651	5,307	5,940	5,893	6,744	6,737	7,268	6,996	5,468	5,090	4,887	5,006	69,987	64,788
Finished avgas	55	75	52	71	88	32	49	99	114	170	57	38	900	1,545
Total	4,706	5,382	5,992	5,964	6,832	6,769	7,317	7,095	5,582	5,260	4,944	5,044	70,887	66,333
Exports from—														
District 1	3	35	1	40	11	59	6	50	6	17	6	59	293	195
District 2	9		25	20	10	1	11	8	22			19	125	116
District 3	120	442	251	199	58	296	223	236	452	428	440	524	3,669	3,687
District 4														
District 5	110	20	95	60	14	141	19	18	17	35	13	14	556	601
Total	242	497	372	319	93	497	259	312	497	480	459	616	4,643	4,599
Stocks:														
By grades:														
Military 115–145	1,905	1,784	2,098	1,911	2,066	1,602	1,569	1,395	1,400	1,103	782	1,152	1,152	1,510
Military 100–130	79	53	51	66	60	54	53	46	51	56	52	34	34	145
Commercial 115–145	2,931	2,712	2,816	2,875	2,595	2,751	2,536	2,335	2,388	2,126	1,963	2,285	2,285	2,863
Commercial 100–130	2,519	2,402	2,392	2,334	2,298	2,223	1,909	1,956	1,966	1,961	2,291	2,129	2,129	2,248
91–98	394	367	360	311	288	274	243	236	211	223	234	217	217	388
Other grades (including commercial 108–135)	745	683	638	734	657	697	669	619	717	723	834	867	867	689
Alkylate	3,486	3,652	3,937	3,926	4,047	4,045	3,422	2,893	2,830	3,069	2,669	2,707	2,707	3,039
Total	12,059	11,653	12,292	12,157	12,011	11,646	10,401	9,480	9,563	9,261	8,825	9,391	9,391	10,882

See footnotes at end of table.

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TABLE 46.—Salient statistics of aviation gasoline in the United States,[1] by mounths and year 1962—Continued

(Thousand barrels)

Item	1963													1962 total
	January	February	March	April	May	June	July	August	September	October	November	December	Total	
Domestic demand: All grades (including alkylate)	3,433	3,655	3,652	4,398	4,428	3,995	4,635	4,708	3,361	4,557	4,804	4,531	50,157	52,083
Total demand: All grades (including alkylate)	3,675	4,152	4,024	4,717	4,521	4,492	4,894	5,020	3,858	5,037	5,263	5,147	54,800	56,682
Deliveries:														
To U.S. military:														
Military 115-145	922	1,256	741	998	1,394	1,201	997	1,491	1,116	1,538	1,975	1,422	15,051	19,534
Military 100-130	4	3	4	4	3	6	7	3	3	5	3	3	48	296
Commercial 115-145	374	714	791	761	644	468	573	169	167	429	425	937	6,452	5,491
Commercial 100-130	32	4	4	6	4	4	9	4	5	5	4	5	86	324
91-98	12	12	2	10	2	20	12	3	9	12	5	4	103	127
Other grades (including commercial 108-135)	34	17	61	40	49	29	76	45	51	57	34	25	518	425
Total	1,378	2,006	1,603	1,819	2,096	1,728	1,674	1,715	1,351	2,046	2,446	2,396	22,258	26,197
To other consumers and exports:														
Military 115-145	231	198	207	304	165	261	306	186	141	155	153	153	2,460	3,948
Military 100-130	104	21	22	21	22	25	23	24	22	21	20	18	343	452
Commercial 115-145	705	710	831	989	808	959	1,296	1,452	898	956	1,002	758	11,364	8,333
Commercial 100-130	865	772	874	975	1,000	958	999	1,069	924	1,018	943	1,016	11,413	11,263
91-98	43	29	51	34	49	34	32	43	32	30	28	25	430	599
Other grades (including commercial 108-135)	143	145	182	245	252	278	328	331	287	250	170	218	2,829	2,154
Alkylate	206	271	254	330	129	249	236	200	203	561	501	563	3,703	3,736
Total	2,297	2,146	2,421	2,898	2,425	2,764	3,220	3,305	2,507	2,991	2,817	2,751	32,542	30,485
Shipments originating in—														
District 1	179	257	122	132	307	181	235	207	50	365	44	80	2,159	3,289
District 2	475	358	408	549	446	534	522	721	654	691	379	420	6,157	6,029
District 3	1,875	2,722	2,539	3,240	2,543	2,528	3,001	2,722	2,289	2,669	3,648	3,819	33,595	33,365
District 4	95	96	102	97	125	101	111	120	104	113	90	84	1,238	1,299
District 5	1,051	719	853	699	1,100	1,148	1,025	1,250	761	1,199	1,102	744	11,651	12,700
Total	3,675	4,152	4,024	4,717	4,521	4,492	4,894	5,020	3,858	5,037	5,263	5,147	54,800	56,682

[1] Included in gasoline figures in other tables of this report.

[2] Excludes alkylate produced and blended to finished avgas during the month.

[3] Represents alkylate and a small amount of finished avgas transferred or used in the production of other products, mainly automotive gasoline.

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GASOLINE

The total demand for gasoline was 4,498,000 barrels daily in 1963 and included a domestic demand of 4,479,000 barrels daily and exports of 19,000 barrels daily. At the beginning of 1963, 1,455,000 barrels of naphthas considered to be petrochemical feedstocks were transferred from gasoline and naphtha stocks to that new category.

Civilian highway use of gasoline, as calculated from data compiled by the Bureau of Public Roads, totaled 1,458.9 million barrels in 1963 compared with 1,398.7 million barrels in 1962. Nonhighway motor vehicles, military vehicles, stationary and marine engines, and losses, consumed the remainder (125.8 million barrels).

The production of gasoline and naphtha from crude oil in 1963 was 1,413,081,000 barrels. Natural-gas liquids plants produced 214,814,000 barrels, and in addition, 80,000 barrels of benzol were blended into the gasoline at the refineries.

Table 49 shows consumption and distribution of gasoline by PAD districts, and the interdistrict shipments which balance the supply and demand for each district. The consumption data compiled by the American Petroleum Institute exclude naphtha and offshore military shipments. For comparative purposes in the table, the naphtha has been excluded from gasoline production and stocks. No breakdown is available on the 24.6 million barrels of natural gas liquids which were blended with gasoline at terminal facilities away from the refineries in 1963, therefore it has been omitted from the production figures. This roughly offsets the omission of offshore military shipments in consumption data.

Gasoline deliveries by pipeline increased 13,194,000 barrels in 1963 to 787,414,000 barrels. A new products pipeline company began operating in September. When the line is completed it will run from the gulf coast to the vicinity of New York City. Tidewater shipments of gasoline from the gulf to the east coast were 244,957,000 barrels in 1963 compared with 241,303,000 barrels in 1962. A small quantity of gasoline (465,000 barrels) was shipped by water from the west coast to the east coast. Interdistrict barge shipments of gasoline on the Mississippi River totaled 51,947,000 barrels in 1963, a decline of 1,455,000 barrels for the year. Gasoline shipments from the gulf to the west coast were a half million barrels less than in 1962. Data on intradistrict barge shipments are not available.

Stocks of gasoline and naphtha increased at the rate of 6,000 barrels daily during 1963, and at the end of the year totaled 190,937,000 barrels. This includes stocks held at refineries, at bulk terminals operated by refineries and pipeline companies but does not include those held by secondary distributors, by consumers, or in military custody. The Bureau of Mines definition of a bulk-terminal installation is any storage facility operated by a refining or pipeline companies which receives its principal products by tanker, barge, or pipeline or any storage point which has a combined capacity for storing refined products of 50,000 barrels or more regardless of transportation means by which products are received.

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TABLE 47.—Salient statistics of gasoline and naphtha in the United States, 1961 total and 1962–63, by months

(Thousand barrels)

	January	February	March	April	May	June	July	August	September	October	November	December	Total	1961 total
	1962													
Production:														
Finished gasoline from crude oil	113,370	102,183	111,283	106,015	113,041	114,756	120,165	116,725	113,202	111,885	109,880	117,904	1,350,409	1,312,663
Naphtha from crude oil	3,153	2,523	3,108	2,624	3,380	2,896	3,305	3,188	3,147	3,024	3,647	3,302	37,297	32,156
Total gasoline production from crude oil	116,523	104,706	114,391	108,639	116,421	117,652	123,470	119,913	116,349	114,909	113,527	121,206	1,387,706	1,344,819
Gasoline produced from natural gas liquids	16,377	14,271	15,664	15,081	15,599	15,216	16,391	16,806	16,217	17,952	17,902	18,103	195,579	189,474
Benzol blended	9	5	4	10	6	4	3	4	10	12	13	11	91	169
Total gasoline and naptha production	132,909	118,982	130,059	123,730	132,026	132,872	139,864	136,723	132,576	132,873	131,442	139,320	1,583,376	1,534,462
Daily average	4,287	4,249	4,195	4,124	4,259	4,429	4,512	4,410	4,419	4,286	4,381	4,494	4,338	4,204
Imports	444	873	829	992	1,029	1,438	987	1,355	1,561	1,401	1,284	1,685	13,878	10,685
Exports	393	400	284	821	418	537	614	757	703	839	397	429	6,592	8,976
Daily average	13	14	9	27	13	18	20	24	23	27	13	14	18	25
Stocks, end of period:														
Finished gasoline	189,789	199,878	199,704	194,698	186,759	180,107	177,348	167,638	174,733	171,336	170,351	184,512	184,512	179,030
Naphtha	5,803	5,867	6,259	5,727	5,607	5,427	5,719	5,384	5,163	5,072	5,064	5,626	5,626	5,137
Total stocks	195,592	205,745	205,963	200,425	192,366	185,534	183,067	173,022	179,896	176,408	175,415	190,138	190,138	184,167
Domestic demand	121,535	109,302	130,386	129,439	140,696	140,605	142,704	147,366	126,560	136,923	133,322	125,853	1,584,691	1,533,173
Daily average	3,920	3,904	4,206	4,315	4,539	4,687	4,603	4,754	4,219	4,417	4,444	4,060	4,342	4,200

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	1963 [1]												1962 total
Production:													
Finished gasoline from crude oil	115,799	105,895	113,827	107,998	114,458	117,732	122,678	123,688	115,299	116,650	114,613	121,757	1,390,394	1,350,409
Naphtha from crude oil	1,867	1,516	1,919	1,686	1,782	1,880	1,979	2,091	1,822	2,041	1,913	2,191	22,687	37,297
Total gasoline production from crude oil	117,666	107,411	115,746	109,684	116,240	119,612	124,657	125,779	117,121	118,691	116,526	123,948	1,413,081	1,387,706
Gasoline produced from natural gas liquids	17,756	16,261	16,956	17,194	17,166	17,163	16,800	18,184	18,622	19,541	19,063	20,108	214,814	195,579
Benzol blended	7	6	7	10	7	6	7	7	6	7	5	5	80	91
Total gasoline and naptha production	135,429	123,678	132,709	126,888	133,413	136,781	141,464	143,970	135,749	138,239	135,594	144,061	1,627,975	1,583,376
Daily average	4,369	4,417	4,281	4,230	4,304	4,559	4,563	4,644	4,525	4,459	4,520	4,647	4,460	4,338
Imports	1,589	750	1,487	1,923	1,060	1,488	1,068	1,242	1,848	1,569	932	1,189	16,145	13,878
Exports	316	699	537	560	237	685	453	474	667	783	652	876	6,939	6,592
Daily average	10	25	17	19	8	23	15	15	22	25	22	28	19	18
Stocks, end of period:														
Finished gasoline	196,438	205,323	210,833	201,075	192,193	189,098	181,157	174,483	177,308	174,354	177,626	186,860	186,860	[2] 183,701
Naphtha	4,567	4,073	3,884	3,712	3,513	3,531	3,555	3,862	3,975	3,911	3,631	4,077	4,077	[2] 4,982
Total stocks	201,005	209,396	214,717	204,787	195,706	192,629	184,712	178,345	181,283	178,265	181,257	190,937	190,937	[2] 188,683
Domestic demand	124,380	115,338	128,338	138,181	143,317	140,661	149,996	151,105	133,992	142,043	132,882	134,694	1,634,927	1,584,691
Daily average	4,012	4,119	4,140	4,606	4,623	4,689	4,839	4,874	4,466	4,582	4,429	4,345	4,479	4,342

[1] Preliminary figures.
[2] New basis. These data are comparable to 1963 due to product reclassification resulting from separately reporting data for petrochemical feedstocks.

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TABLE 48.—Production of gasoline and naphtha at refineries in the United States in 1963,[1] by districts and months

(Thousand barrels)

	January	February	March	April	May	June	July	August	September	October	November	December	Total
Gasoline from crude oil:													
East Coast	15,840	15,233	15,782	16,674	16,151	16,767	17,934	17,502	16,047	16,456	15,239	17,313	196,938
Appalachian No. 1	1,287	1,083	1,232	988	1,064	1,343	1,419	1,409	1,410	1,163	1,346	1,448	15,192
Appalachian No. 2	1,556	1,365	1,386	1,160	1,441	1,357	1,632	1,696	1,706	1,680	1,412	1,500	17,891
Indiana, Illinois, Kentucky, etc.	21,808	20,443	22,705	21,215	21,894	23,575	24,631	24,384	23,453	22,195	22,905	23,437	272,645
Minnesota, Wisconsin, etc.	1,949	1,837	2,072	1,834	1,431	1,383	2,172	2,166	1,780	2,119	1,976	2,236	22,955
Oklahoma, Kansas, etc.	11,034	10,423	10,596	9,322	11,296	11,149	12,104	12,058	11,498	10,830	11,265	11,669	133,244
Texas Inland	4,894	4,374	4,679	3,708	4,425	4,519	4,882	4,607	4,301	4,426	4,234	4,423	53,472
Texas Gulf Coast	24,509	22,559	24,325	23,495	25,240	25,170	25,329	25,976	23,444	25,599	24,470	25,910	296,026
Louisiana Gulf Coast	10,378	8,892	9,848	9,236	10,166	10,412	9,752	10,107	9,409	10,614	10,137	11,508	120,459
Arkansas, Louisiana Inland, etc.	1,277	1,266	1,409	1,429	1,320	1,298	1,202	1,448	1,274	1,508	1,431	1,452	16,314
New Mexico	408	366	353	258	311	417	369	418	396	309	386	378	4,369
Rocky Mountain	4,405	3,886	4,084	3,016	4,244	4,521	4,448	4,517	4,185	4,063	4,356	4,336	50,061
West Coast	16,454	14,168	15,356	15,663	15,475	15,821	16,804	17,400	16,396	15,688	15,456	16,147	190,828
Total gasoline from crude	115,799	105,895	113,827	107,998	114,458	117,732	122,678	123,688	115,299	116,650	114,613	121,757	1,390,394
Natural gas liquids blended at refineries:													
East Coast	540	419	420	301	146	231	231	262	300	358	320	362	3,890
Appalachian No. 1	15	14	7	4	3	1	3	1		1	3	2	54
Appalachian No. 2	14	80	65	34	45	55	59	73	104	111	109	132	881
Indiana, Illinois, Kentucky, etc.	1,582	1,381	1,028	1,156	1,247	818	1,021	956	1,315	1,686	1,758	2,159	16,107
Minnesota, Wisconsin, etc.	123	114	114	94	79	67	130	147	172	145	155	152	1,492
Oklahoma, Kansas, etc.	1,717	1,441	1,587	1,469	1,493	1,517	1,355	1,583	1,579	1,707	1,853	1,912	19,213
Texas Inland	1,946	1,617	1,917	2,242	2,226	1,962	1,674	2,294	2,592	2,239	2,057	2,005	24,771
Texas Gulf Coast	5,769	4,926	5,590	5,597	5,968	5,793	6,047	6,268	6,001	6,469	6,195	6,036	70,659
Louisiana Gulf Coast	1,686	1,523	1,381	1,287	1,202	1,192	1,188	1,242	1,217	1,360	1,314	1,434	16,026
Arkansas, Louisiana Inland, etc.	687	570	654	625	583	621	677	623	562	647	621	687	7,557
New Mexico	109	89	98	118	89	150	140	138	139	134	138	126	1,468
Rocky Mountain	369	334	367	333	328	320	330	314	319	366	362	385	4,127
West Coast	2,050	1,835	2,072	2,003	1,941	2,011	1,931	1,983	1,935	2,209	1,788	2,140	23,898
Total natural gas liquids blended	16,607	14,343	15,300	15,263	15,350	14,738	14,786	15,884	16,235	17,432	16,673	17,532	[2] 190,143

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Benzol blended	7	6	7	10	7	6	7	7	6	7	5	5	80
Total gasoline produced at refineries	132,413	120,244	129,134	123,271	129,815	132,476	137,471	139,579	131,540	134,089	131,291	139,294	1,580,617
Naphtha from crude oil:													
East Coast	85	48	105	129	92	120	134	164	129	156	129	153	1,444
Appalachian No. 1	23	26	29	27	31	30	44	43	46	50	46	28	423
Appalachian No. 2	16	6	8	5	3	7	18	20	21	19	6	19	148
Indiana, Illinois, Kentucky, etc	258	218	295	352	341	381	370	331	313	366	304	333	3,862
Minnesota, Wisconsin, etc													
Oklahoma, Kansas, etc	182	171	217	189	196	165	214	188	190	153	167	133	2,165
Texas Inland	28	22	36	35	45	38	36	41	46	35	35	31	428
Texas Gulf Coast	1,043	745	982	637	777	852	910	944	881	980	961	1,063	10,795
Louisiana Gulf Coast	42	8	50	53	46	68	43	10	63	18	53	26	480
Arkansas, Louisiana Inland, etc	78	67	50	76	73	56	57	42	61	60	67	68	755
New Mexico													
Rocky Mountain	33	27	5	20	5	16	19	15	28	8	24	18	218
West Coast	79	178	142	163	173	147	134	293	44	196	121	299	1,969
Total naphtha from crude oil	1,867	1,516	1,919	1,686	1,782	1,880	1,979	2,091	1,822	2,041	1,913	2,191	22,687
Total gasoline and naphtha produced at refineries	134,280	121,760	131,053	124,957	131,597	134,356	139,450	141,670	133,362	136,130	133,204	141,485	1,603,304

[1] Preliminary figures.
[2] Excludes gasoline blended at terminal facilities.

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The dealer's average net price for regular-grade gasoline (exclusive of dealer's margin and sales tax) in 55 representative cities in the United States provides an index of wholesale gasoline prices. The average service station price (excluding taxes) decreased from 20.36 cents per gallon in 1962 to 20.11 cents per gallon in 1963. The average tax on gasoline in 1963 was 10.31 cents per gallon. Federal tax was 4.00 cents per gallon; State taxes, including some local taxes, averaged 6.31 cents per gallon.

TABLE 49.—Consumption, production, and distribution [1] of gasoline in 1963, by PAD districts

(Million barrels)

	PAD districts					
	1	2	3	4	5	Total
Consumption [2]	562.2	567.2	213.1	48.7	236.5	1,627.7
Supply:						
Production [3]	216.1	484.5	611.1	54.2	214.7	1,580.6
Imports	14.5	.2	.1		1.3	16.1
Received from other districts:						
From District 1		17.9	.3			
From District 2	9.1		12.6	.1		
From District 3	350.9	90.7		3.8	10.8	
From District 4		3.7			9.3	
From District 5	.5			2.8		
Total receipts	360.5	112.3	12.9	6.7	20.1	
Total supply	591.1	597.0	624.1	60.9	236.1	1,596.7
Stock change [4]	+5.9	+2.5	−2.7	+.1	−2.7	+3.1
Shipped to other districts	18.2	21.8	456.2	13.0	3.3	
Exports	.6	.5	4.7		1.1	6.9
Domestic demand	566.4	572.2	165.9	47.8	234.4	1,586.7
Difference between consumption and demand	−4.2	−5.0	+47.2	+.9	+2.1	+41.0

[1] Apparent distribution of gasoline by districts is based on actual data on tidewater and river shipments compiled by the Geological Survey, U.S. Department of the Interior. An estimate of annual interdistrict railroad shipments was computed from 1961 data compiled by the Bureau of Transport Economics, Interstate Commerce Commission, and records compiled by the San Francisco office of the Bureau of Mines. Interdistrict pipeline shipments are compiled by the Bureau of Mines. Information on shipments moving from PAD District 2 by way of the Great Lakes ports and the Ohio River to PAD District 1 were compiled from data supplied by the U.S. Army Corps of Engineers.

[2] Compiled by the American Petroleum Institute.

[3] Excludes naphtha production and gasoline blended at terminal facilities.

[4] Excludes naphtha.

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TABLE 50.—Production (refinery output) and consumption of gasoline (excluding naphtha) in the United States, by States

(Thousand barrels)

	1961		1962		1963 [1]	
	Production	Consumption [2]	Production	Consumption [2]	Production	Consumption [2]
Alabama	(3)	24,810	(3)	25,913	(3)	26,777
Alaska		1,832		1,697		1,624
Arizona		12,828		13,626		14,288
Arkansas	12,512	15,107	12,168	16,038	12,697	16,824
California	[4] 200,655	149,385	[4] 205,837	154,958	[4] 214,726	162,945
Colorado	6,692	17,664	6,991	18,191	7,051	18,455
Connecticut		19,397		20,364		21,249
Delaware	(5)	5,075	(5)	5,292	(5)	5,464
District of Columbia		4,885		5,174		5,326
Florida		46,070		48,084		50,164
Georgia	(6)	32,223	(6)	34,250	(6)	35,689
Hawaii	(4)	5,741	(4)	4,581	(4)	4,490
Idaho		7,018		7,131		7,191
Illinois	110,455	73,835	107,708	76,853	112,187	81,966
Indiana	72,392	43,374	72,219	44,403	72,606	45,608
Iowa		28,863		28,936		29,982
Kansas	62,166	26,231	63,825	26,851	65,329	27,233
Kentucky	[7] 14,847	22,237	[7] 15,209	23,377	[7] 16,188	24,395
Louisiana	[3] 143,895	23,296	[3] 152,491	24,342	[3] 147,659	24,956
Maine		8,321		8,379		8,564
Maryland	(6)	22,861	(6)	23,959	(6)	25,355
Massachusetts	[5] 27,645	35,523	[5] 27,154	36,403	[5] 22,388	37,458
Michigan	20,513	65,620	21,431	68,093	23,710	71,542
Minnesota	11,468	32,702	11,945	33,344	12,725	34,348
Mississippi	(3)	16,185	(3)	16,989	(3)	17,999
Missouri	[8] 11,747	41,775	[8] 13,594	42,959	[8] 12,439	43,983
Montana	10,328	7,930	11,943	8,753	12,733	8,848
Nebraska	(8)	15,004	(8)	15,523	(8)	16,011
Nevada		4,078		4,655		5,132
New Hampshire		4,977		5,117		5,321
New Jersey	66,195	49,159	62,044	50,228	78,047	52,833
New Mexico	4,746	9,728	5,416	10,098	5,837	10,619
New York	12,732	106,724	11,909	112,743	12,696	117,586
North Carolina		37,628		38,157		40,304
North Dakota	[9] 9,800	7,561	[9] 10,888	7,786	[9] 11,722	8,017
Ohio	75,957	77,602	76,054	80,705	82,851	81,547
Oklahoma	71,466	26,848	74,292	27,848	74,689	28,269
Oregon		17,072		17,501		18,029
Pennsylvania	85,905	77,653	92,993	79,610	95,484	81,268
Rhode Island	(5)	6,017	(5)	6,079	(5)	6,270
South Carolina	(6)	18,018	(6)	18,744	(6)	19,472
South Dakota		8,581		8,943		9,320
Tennessee	(7)	29,871	(7)	29,411	(7)	30,663
Texas	410,463	112,366	436,740	117,287	444,928	115,949
Utah	15,537	9,144	16,332	9,152	16,536	9,481
Vermont		3,273		3,347		3,468
Virginia	[6] 6,539	31,893	[6] 6,418	33,070	[6] 6,752	34,276
Washington	(4)	28,879	(4)	30,153	(4)	30,004
West Virginia	705	12,431	716	11,790	731	12,101
Wisconsin	(9)	32,753	(9)	33,430	(9)	34,352
Wyoming	16,750	4,380	16,939	4,544	17,906	4,728
Total	1,482,110	1,522,428	1,533,256	1,574,861	1,580,617	1,627,743

[1] Preliminary figures.
[2] American Petroleum Institute
[3] Alabama and Mississippi included with Louisiana.
[4] Washington and Hawaii included with California.
[5] Delaware and Rhode Island included with Massachusetts.
[6] Maryland, South Carolina, and Georgia included with Virginia.
[7] Tennessee included with Kentucky.
[8] Nebraska included with Missouri.
[9] Wisconsin included with North Dakota.

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TABLE 51.—Stocks of gasoline and naphtha in the United States in 1963, by districts and months

(Thousand barrels)

	Jan. 31	Feb. 28	Mar. 31	Apr. 30	May 31	June 30	July 31	Aug. 31	Sept. 30	Oct. 31	Nov. 30	Dec. 31
Gasoline: [1]												
East Coast	40,875	42,718	43,904	46,061	46,277	46,716	45,030	43,036	41,898	39,983	44,118	46,624
Appalachian No. 1	5,114	4,861	5,090	5,084	4,694	5,254	5,559	4,952	4,897	4,705	5,092	5,311
Appalachian No. 2	2,970	3,210	3,411	3,100	3,020	2,948	3,010	2,970	3,221	3,203	3,044	3,057
Indiana, Illinois, Kentucky, etc	33,701	35,580	37,260	34,480	31,378	30,854	29,664	29,210	30,526	27,781	29,340	30,564
Minnesota, Wisconsin, North Dakota and South Dakota	6,801	6,895	7,808	7,320	7,290	7,016	6,839	6,280	6,572	6,501	6,742	6,972
Oklahoma, Kansas, etc	17,491	18,528	18,918	17,823	17,616	16,104	15,886	16,244	16,666	16,372	16,948	18,981
Texas Inland	8,263	8,880	8,908	7,579	7,326	7,005	6,839	6,478	7,065	6,809	6,943	7,315
Texas Gulf Coast	28,323	29,022	29,667	26,224	22,862	22,712	21,039	20,543	20,271	23,532	20,998	21,349
Louisiana Gulf Coast	12,625	12,967	12,715	11,506	11,178	11,209	10,501	10,316	12,130	11,233	9,530	10,842
Arkansas, Louisiana Inland, etc	6,639	6,866	7,307	6,712	6,539	6,476	6,000	5,804	5,903	7,066	7,334	7,270
New Mexico	818	881	859	682	695	696	653	672	791	636	659	719
Rocky Mountain	6,556	7,324	7,676	6,701	6,633	6,477	5,533	4,641	4,663	4,530	5,175	5,801
West Coast	26,262	27,591	27,310	27,803	26,685	25,631	24,604	22,706	22,705	22,003	21,703	22,055
Total gasoline	196,438	205,323	210,833	201,075	192,193	189,098	181,157	173,852	177,308	174,354	177,626	186,860
Naphtha:												
East Coast	564	492	491	471	488	431	447	564	537	476	483	587
Appalachian No. 1	60	61	60	47	47	56	77	74	82	95	92	86
Appalachian No. 2	19	13	10	9	16	9	9	14	19	21	15	21
Indiana, Illinois, Kentucky, etc	428	408	417	427	412	408	480	509	575	578	533	656
Minnesota, Wisconsin, North Dakota and South Dakota	288	280	293	233	219	200	210	230	278	241	226	241
Oklahoma, Kansas, etc	34	26	25	22	27	31	35	32	42	30	32	34
Texas Inland	1,565	1,434	1,309	1,205	1,124	1,283	1,279	1,379	1,479	1,551	1,379	1,456
Texas Gulf Coast	88	59	83	105	113	135	117	93	103	75	59	49
Louisiana Gulf Coast	102	123	120	115	74	70	71	59	72	78	80	101
Arkansas, Louisiana Inland, etc												
New Mexico	54	69	44	50	33	29	29	25	32	19	27	30
Rocky Mountain	1,365	1,108	1,032	1,028	960	879	801	883	756	747	705	816
West Coast												
Total naphtha	4,567	4,073	3,884	3,712	3,513	3,531	3,555	3,862	3,975	3,911	3,631	4,077

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Total gasoline and naphtha:												
East Coast	41,439	43,210	44,395	46,532	46,765	47,147	45,477	43,600	42,435	40,459	44,601	47,211
Appalachian No. 1	5,174	4,922	5,150	5,131	4,741	5,310	5,636	5,026	4,979	4,800	5,184	5,397
Appalachian No. 2	2,989	3,223	3,421	3,109	3,036	2,957	3,019	2,984	3,240	3,224	3,059	3,078
Indiana, Illinois, Kentucky, etc	34,129	35,988	37,677	34,907	31,790	31,262	30,144	29,719	31,101	28,359	29,873	31,220
Minnesota, Wisconsin, North Dakota and South Dakota	6,801	6,895	7,808	7,320	7,290	7,016	6,839	6,280	6,572	6,501	6,742	6,972
Oklahoma, Kansas, etc	17,779	18,808	19,211	18,056	17,835	16,304	16,096	16,474	16,944	16,613	17,174	19,222
Texas Inland	8,297	8,906	8,933	7,601	7,353	7,036	6,874	6,510	7,107	6,839	6,975	7,349
Texas Gulf Coast	29,888	30,456	30,976	27,429	23,986	23,995	22,318	21,922	21,750	25,083	22,377	22,805
Louisiana Gulf Coast	12,713	13,026	12,798	11,611	11,291	11,344	10,618	10,409	12,233	11,308	9,589	10,891
Arkansas, Louisiana Inland, etc	6,741	6,989	7,427	6,827	6,613	6,546	6,071	5,863	5,975	7,144	7,414	7,371
New Mexico	818	881	859	682	695	696	653	672	791	636	659	719
Rocky Mountain	6,610	7,393	7,720	6,751	6,666	6,506	5,562	4,666	4,695	4,549	5,202	5,831
West Coast	27,627	28,699	28,342	28,831	27,645	26,510	25,405	23,589	23,461	22,750	22,408	22,871
Total:												
1963	201,005	209,396	214,717	204,787	195,706	192,629	184,712	177,714	181,283	178,265	181,257	190,937
1962	195,592	205,745	205,963	200,425	192,366	185,534	183,067	173,022	179,896	176,408	175,415	[2] 188,683

[1] Includes stocks of gasoline at refineries, bulk terminals, and in pipelines.
[2] New basis. These data are comparable to 1963 due to product reclassification resulting from separately reporting data for petrochemical feedstocks.

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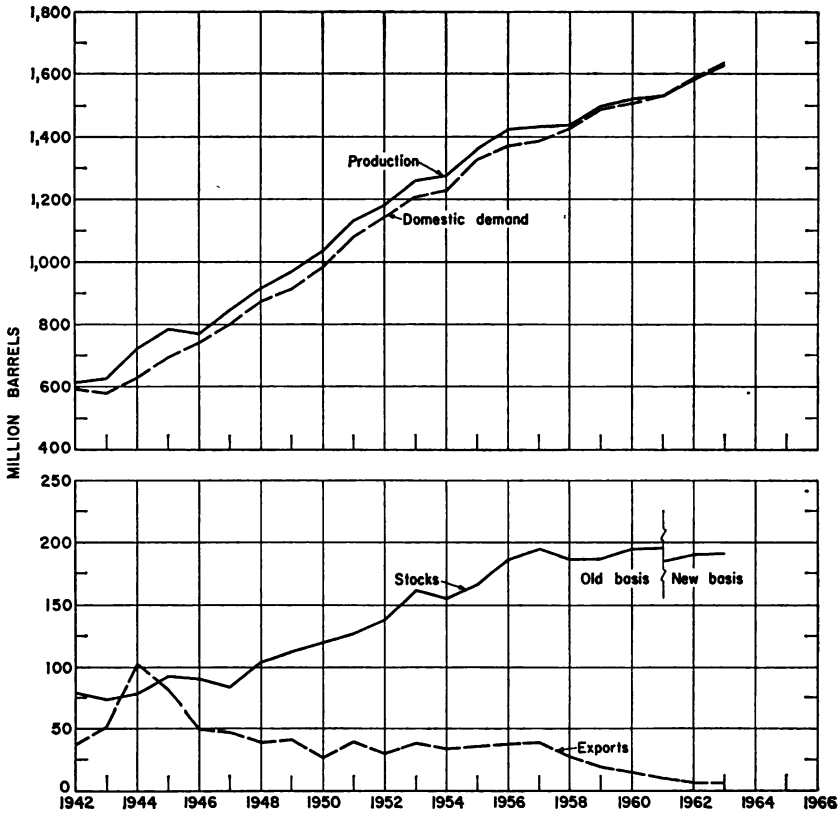

FIGURE 8.—Production, domestic demand, exports, and stocks of gasoline in the United States, 1942–63.

TABLE 52.—Day's supply of gasoline and naphtha on hand in the United States at end of month [1]

	1961	1962	1963 [2]		1961	1962	1963 [2]
January	52.3	49.9	48.5	July	40.1	38.3	37.8
February	50.9	48.8	50.3	August	40.9	40.8	39.6
March	52.2	47.4	46.4	September	41.5	40.5	39.3
April	46.9	44.0	44.2	October	40.3	39.6	40.1
May	42.7	40.9	41.5	November	42.7	43.1	41.4
June	41.2	40.1	39.7	December	46.9	46.9	45.1

[1] Stocks divided by daily average total demand (domestic demand plus exports) for succeeding month.
[2] Preliminary figures.

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TABLE 53.—Average monthly prices of gasoline in the United States

(Cents per gallon)

Monthly average	Jan.	Feb.	Mar.	Apr.	May	June	July
1962:							
At refineries in Oklahoma, regular, 91 octane	12.34	11.26	10.84	12.64	12.91	13.00	13.00
Of 55 cities on 1st of month:							
Dealer's net (excluding tax)	15.74	15.66	15.06	14.94	14.73	15.21	14.88
Service station (including State, local, and Federal taxes)	30.69	30.71	30.15	30.12	29.77	30.12	30.06
1963:							
At refineries in Oklahoma, regular, 91 octane	12.10	11.64	12.00	12.48	12.75	13.06	12.94
Of 55 cities on 1st of month:							
Dealer's net (excluding tax)	15.45	15.26	14.64	14.91	15.55	14.35	15.75
Service station (including State, local, and Federal taxes)	30.67	30.43	29.56	30.03	30.67	29.46	31.14

	Aug.	Sept.	Oct.	Nov.	Dec.	Average for year
1962:						
At refineries in Oklahoma, regular, 91 octane	13.00	13.00	13.00	13.00	12.77	12.56
Of 55 cities on 1st of month:						
Dealer's net (excluding tax)	15.15	16.35	15.96	15.67	16.10	15.45
Service station (including State, local, and Federal taxes)	30.49	31.88	31.21	31.01	31.43	30.64
1963:						
At refineries in Oklahoma, regular, 91 octane	12.19	11.80	12.23	11.00	11.57	12.15
Of 55 cities on 1st of month:						
Dealer's net (excluding tax)	15.70	15.85	15.18	14.76	15.22	15.22
Service station (including State, local, and Federal taxes)	31.16	31.07	30.39	30.08	30.43	30.42

Source: Platt's Oil Price Handbook and Platt's Oilgram Price Service.

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TABLE 54.—Transportation of petroleum products by pipeline, by months

(Thousand barrels)

Item	January	February	March	April	May	June	July	August	September	October	November	December	Total
1962:													
Turned into lines: [1]													
Gasoline	58,571	56,120	63,008	63,732	67,913	69,308	69,195	68,057	64,398	66,428	65,014	64,552	775,296
Kerosine	8,237	7,219	6,619	5,267	4,669	4,686	5,036	6,318	5,631	6,788	6,671	8,107	75,248
Distillate fuel oil	31,204	25,931	22,655	17,035	16,758	16,973	18,299	19,890	18,926	20,726	25,595	30,452	264,444
Military jet fuel	2,345	2,057	2,349	2,203	3,140	2,481	2,523	2,859	2,127	2,437	1,853	2,308	28,681
Natural gas liquids	10,016	7,413	8,464	6,789	6,711	7,263	7,963	7,903	7,686	8,486	9,819	12,294	100,807
Delivered from lines: [1]													
Gasoline	59,093	54,061	62,282	62,451	68,426	68,830	69,290	69,773	63,490	67,327	65,751	63,446	774,220
Kerosine	7,853	7,753	6,802	5,487	4,922	4,367	4,917	5,515	5,596	6,437	6,675	8,064	74,388
Distillate fuel oil	33,222	28,141	24,559	17,158	15,260	15,373	16,631	17,744	17,998	20,215	25,300	32,984	264,585
Military jet fuel	2,431	1,996	2,489	2,121	3,052	2,704	2,433	2,664	2,399	2,210	1,945	2,056	28,500
Natural gas liquids	9,697	8,010	8,193	7,148	6,721	7,253	7,476	8,133	7,280	8,508	9,439	11,691	99,549
Shortage (overage): [2]													
Gasoline	38	7	(26)	57	(40)	64	76	16	74	24	(62)	11	239
Kerosine	127	69	105	59	85	89	57	112	83	101	99	124	1,110
Distillate fuel oil	32	(15)	(13)	(25)	(14)	(60)	36	(25)	(6)	(23)	(176)	135	(154)
Military jet fuel	4	(3)	11	1	11	6	----------	3	7	7	(3)	19	63
Natural gas liquids	67	24	20	15	26	37	38	22	23	139	37	103	551
Stocks in lines and working tanks at end of month:													
Gasoline	24,013	26,065	26,817	28,041	27,568	26,982	26,811	25,079	25,913	24,990	24,315	25,410	25,410
Kerosine	3,103	2,500	2,212	1,933	1,595	1,825	1,887	2,578	2,530	2,780	2,677	2,596	2,596
Distillate fuel oil	13,563	11,368	9,477	9,379	10,891	12,551	14,183	16,354	17,288	17,822	18,293	15,626	15,626
Military jet fuel	570	634	482	563	640	411	501	693	414	634	545	778	778
Natural gas liquids	4,105	3,484	3,735	3,361	3,325	3,298	3,747	3,495	3,878	3,717	4,060	4,560	4,560

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1963:													
Turned into lines:													
Gasoline	59,262	55,220	61,716	63,916	68,506	67,922	70,703	69,233	68,238	70,070	69,604	69,019	793,409
Kerosine	9,121	6,876	7,131	5,212	5,037	5,049	5,734	5,820	6,311	7,962	8,447	9,896	82,596
Distillate fuel oil	32,921	29,492	25,542	17,563	17,777	19,939	20,064	20,117	19,932	21,963	23,673	31,327	280,310
Military jet fuel	2,552	2,405	2,853	2,340	2,573	2,368	2,312	2,437	2,334	2,519	2,221	2,146	29,060
Natural gas liquids	13,107	10,254	7,971	7,272	7,789	7,527	8,930	10,169	9,483	10,172	10,524	14,024	117,222
Delivered from lines: [1]													
Gasoline	59,045	53,937	60,079	63,699	68,675	68,538	71,482	69,629	66,479	69,302	67,387	69,162	787,414
Kerosine	8,703	7,451	6,657	5,224	4,970	4,844	5,325	5,568	5,885	7,265	7,856	9,401	79,239
Distillate fuel oil	34,703	31,518	26,986	17,597	16,969	17,238	18,901	18,214	18,381	21,098	22,214	33,108	276,927
Military jet fuel	2,489	2,413	2,795	2,347	2,778	2,239	2,330	2,519	2,328	2,508	2,086	2,328	29,160
Natural gas liquids	13,001	10,382	8,890	7,246	7,563	7,357	9,013	9,857	8,519	9,677	10,618	13,754	115,877
Shortage (or overage): [2]													
Gasoline	(8)	(62)	(128)	63	8	(69)	47	58	54	(6)	85	(65)	(23)
Kerosine	133	160	132	105	75	100	96	129	93	95	116	192	1,426
Distillate fuel oil	(2)	(103)	16	(119)	29	2	27	(69)	(26)	(36)	(109)	4	(386)
Military jet fuel	(1)	84	10	13	8	----------	11	12	9	(19)	31	4	162
Natural gas liquids	80	101	47	15	27	24	21	(4)	38	10	28	11	398
Stocks in lines and working tanks at end of month:													
Gasoline	25,635	26,980	28,745	28,899	28,722	28,175	27,349	26,895	28,600	29,374	31,506	31,428	31,428
Kerosine	2,791	2,056	2,398	2,281	2,273	2,378	2,691	2,814	3,147	3,749	4,224	4,527	4,527
Distillate fuel oil	13,846	11,923	10,463	10,548	11,327	14,026	15,162	17,134	18,711	19,612	21,180	19,395	19,395
Military jet fuel	842	750	798	784	571	700	571	577	574	604	708	522	522
Natural gas liquids	4,586	4,357	3,391	3,402	3,601	3,747	3,643	3,959	4,885	5,370	5,248	5,507	5,507

[1] The quantities "Turned into lines" and "Delivered from lines" are on a net basis, eliminating intersystem transfers.
[2] Figures in parentheses represent overage.

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TABLE 55.—Transportation of petroleum products by pipeline between PAD districts in the United States, by months

(Thousand barrels)

	January	February	March	April	May	June	July	August	September	October	November	December	Total
1962:													
From District 1 to District 2:													
Gasoline	1,440	1,255	1,584	1,239	1,567	1,469	1,641	1,601	1,400	1,593	1,625	1,488	17,902
Kerosine	138	127	50	48	61	42	22	41	84	81	140	135	969
Distillate fuel oil	312	397	223	252	234	221	320	325	313	215	335	301	3,448
From District 2 to District 1:													
Gasoline	453	459	497	430	432	324	400	467	425	253	243	416	4,799
From District 2 to District 3:													
Gasoline	1,018	818	1,176	1,091	923	1,003	910	1,124	1,105	987	1,162	1,203	12,520
Distillate fuel oil	488	118	240	330	273	243	237	453	491	481	419	533	4,306
Military jet fuel	355	195	173	98	----------	50	100	50	50	100	75	30	1,276
From District 3 to District 1:													
Gasoline	6,987	5,765	7,522	7,745	7,894	7,827	8,262	7,784	7,484	8,225	7,468	7,284	90,247
Kerosine	1,509	1,577	880	703	704	615	745	786	1,080	1,200	1,192	1,480	12,471
Distillate fuel oil	2,194	2,068	1,873	1,320	1,586	1,778	1,731	1,818	1,752	1,534	1,912	2,145	21,711
Military jet fuel	110	130	184	202	276	287	269	252	142	89	153	167	2,261
Natural gas liquids	----------	13	81	78	80	147	328	247	174	215	319	567	2,249
From District 3 to District 2:													
Gasoline	3,312	2,876	3,625	3,365	4,097	3,678	3,548	3,883	4,028	4,111	4,078	3,412	44,013
Kerosine	293	272	162	97	98	68	170	166	157	356	191	448	2,478
Distillate	1,308	1,101	697	626	678	581	1,000	941	1,401	1,471	886	954	11,644
Military jet fuel	----------	----------	----------	----------	----------	----------	----------	----------	----------	----------	42	16	58
Natural gas liquids	3,544	2,804	1,982	1,485	1,538	1,738	1,506	1,982	2,199	2,547	3,289	5,770	30,384
From District 3 to District 4:													
Gasoline	249	225	265	269	281	318	318	341	264	296	257	258	3,341
Kerosine	84	3	3	128	154	137	137	133	124	139	129	141	1,312
Distillate fuel oil	42	29	38	33	31	28	28	29	28	30	34	34	384
Natural gas liquids	139	64	89	43	27	24	24	31	47	24	44	88	644
From District 3 to District 5:													
Gasoline	696	579	623	638	647	644	618	569	512	637	597	610	7,370
Kerosine	40	53	41	20	32	27	18	15	20	30	28	33	357
Distillate fuel oil	98	161	145	97	105	127	143	150	137	126	130	150	1,569
Military jet fuel	159	180	220	114	287	230	239	301	120	259	197	177	2,483
From District 4 to District 2:													
Gasoline	158	137	215	234	211	263	272	303	267	217	204	203	2,684
Kerosine	2	2	5	3	3	2	2	4	3	4	4	4	38
Distillate fuel oil	145	86	141	100	88	74	89	99	104	117	81	101	1,225
From District 4 to District 5:													
Gasoline	513	432	484	554	546	662	616	577	633	614	489	583	6,703
Distillate fuel oil	341	347	375	292	245	223	266	297	204	445	406	475	3,916
Military jet fuel	136	141	129	61	201	242	236	262	332	230	196	203	2,369

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1968:														
From District 1 to District 2:														
Gasoline	1,530	1,120	1,287	1,532	1,026	1,455	1,496	1,525	1,553	1,566	1,589	1,491	17,668
Kerosine	113	110	100	46	30	60	16	66	19	75	148	128	897
Distillate fuel oil	220	313	306	232	204	249	258	238	233	325	312	361	3,269
From District 2 to District 1:														
Gasoline	493	297	304	360	400	468	413	770	330	344	386	411	4,976
Natural gas liquids	200	76					115		158	215	346	202	1,321
From District 2 to District 3:														
Gasoline	955	762	994	1,040	1,065	1,049	1,096	866	1,108	930	1,040	1,192	12,097
Distillate fuel oil	664	463	441	284	167	274	277	286	273	419	379	610	4,827
Military jet fuel	80	126	104	113	57	69	125	88	105	55	69	68	1,074
From District 3 to District 1:														
Gasoline	6,957	6,070	7,351	8,019	9,087	7,935	7,956	7,901	7,817	8,038	9,527	10,365	96,973
Kerosine	1,504	1,274	961	896	456	563	787	918	805	910	1,949	1,868	13,016
Distillate fuel oil	2,336	2,372	2,284	1,653	1,325	1,797	1,948	1,675	1,871	1,989	2,955	3,537	25,842
Military jet fuel	150	120	205	199	323	130	255	268	188	225	195	224	2,517
Natural gas liquids	520	561	264	135	148	196	359	367	235	275	382	765	4,177
From District 3 to District 2:														
Gasoline	3,405	2,900	3,705	4,337	4,405	3,827	3,714	4,086	3,945	4,228	3,802	3,335	45,779
Kerosine	437	608	165	197	218	29	149	162	165	132	194	266	2,722
Distillate fuel oil	1,217	1,527	761	626	720	1,060	975	909	1,059	866	768	1,016	11,244
Military jet fuel	15	50											65
Natural gas liquids	4,272	3,696	2,783	1,500	1,706	1,618	2,162	2,729	2,702	3,435	3,291	4,856	34,750
From District 3 to District 4:														
Gasoline	264	239	271	288	297	330	365	381	325	352	324	319	3,755
Kerosine	142	124	137	134	144	140	144	137	146	160	156	149	1,713
Distillate fuel oil	44	28	34	41	44	38	34	40	33	39	39	45	454
Natural gas liquids	156	61	67	31	23	22	24	45	22	23	53	131	648
From District 3 to District 5:														
Gasoline	664	575	598	731	602	649	587	649	629	715	739	562	7,700
Kerosine	33	23	35	25	23	16	14	36	20	20	30	32	319
Distillate fuel oil	116	158	163	153	85	113	119	179	143	156	156	124	1,674
Military jet fuel	202	176	270	140	130	60	60	152	140	120	93	228	1,780
From District 4 to District 2:														
Gasoline	188	212	298	277	282	312	286	335	253	191	218	286	3,098
Kerosine	4	4	4	2	4	3	3	3	2	4	3	2	38
Distillate fuel oil	147	106	145	103	112	94	113	88	116	157	174	130	1,490
From District 4 to District 5:														
Gasoline	513	470	660	537	618	643	547	666	549	573	629	528	6,833
Distillate fuel oil	374	380	407	281	202	242	322	208	286	302	274	475	3,768
Military jet fuel	206	242	343	224	359	197	199	66	117	201	327	332	3,067

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KEROSINE

The total demand for kerosine in 1963 was 172,784,000 barrels and included exports of 558,000 barrels; shipments for commercial jet aircraft fuel, 75,473,000 barrels; and other domestic uses of 96,753,000 barrels. The use of kerosine as fuel in jet aircraft accounts for all the growth in kerosine demand. In 1962 it accounted for 40 percent of the demand, while in 1963 it represented 44 percent. The use of kerosine, imported in bond (duty-free), as jet fuel for aircraft engaged in oversea flights increased from 16,000 barrels daily in 1962 to 23,000 barrels daily in 1963. Pipeline deliveries of kerosine were about 5 million barrels more than in 1962, and tidewater shipments from the gulf to the east coast increased 3 million barrels.

TABLE 56.—Salient statistics of kerosine in the United States, 1962–63, by months and refinery districts

(Thousand barrels)

Month and district	Production from crude	Yield (percent)	Production from natural gas liquids	Imports	Exports	Stocks (end of period)	Domestic demand
	1962						
Month:							
January	14,507	5.4	123	566	16	26,386	21,227
February	14,664	6.1	78	207	10	25,295	16,030
March	12,726	4.9	69	284	16	23,315	15,043
April	11,051	4.6	93	455	21	24,248	10,645
May	11,359	4.4	59	578	20	27,264	8,960
June	11,458	4.4	56	565	15	30,112	9,216
July	13,243	4.9	51	730	37	33,204	10,895
August	12,516	4.7	56	606	67	35,682	10,633
September	12,319	4.8	92	669	28	36,682	12,052
October	13,436	5.3	75	754	40	37,333	13,574
November	13,606	5.4	110	487	26	35,349	16,161
December	15,488	5.7	144	516	41	31,725	19,731
Total	156,373	5.0	1,006	6,417	337	[3] 31,725	164,167
District:							
East Coast	13,636	3.1	----------	4,165	74	12,084	(4)
Appalachian No. 1	1,278	3.4	----------			698	
Appalachian No. 2	2,276	6.4	----------	----------		400	
Indiana, Illinois, Kentucky, etc.	30,515	5.6	----------	----------	9	5,815	
Minnesota, Wisconsin, North Dakota, etc.	2,061	4.4	----------	----------		1,578	
Oklahoma, Kansas, etc.	7,005	2.6	----------	----------		1,604	
Texas Inland	4,294	3.7	368	----------		601	
Texas Gulf Coast	48,664	7.0	99	----------		3,695	
Louisiana Gulf Coast	24,742	9.0	229	----------	189	2,302	
Arkansas, Louisiana Inland, etc.	1,967	4.6	293	----------		533	
New Mexico	228	2.4	17	----------		56	
Rocky Mountain	2,220	2.0	----------	----------	----------	476	
West Coast	17,467	3.7	----------	2,252	65	1,883	
Total	156,373	5.0	1,006	6,417	337	[3] 31,725	164,167

See footnotes at end of table.

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TABLE 56.—Salient statistics of kerosine in the United States, 1962–63, by months and refinery districts—Continued

(Thousand barrels)

Month and district	Production from crude [2]	Yield (percent)	Production from natural gas liquids	Imports	Exports	Stocks (end of period) [2]	Domestic demand [2]	Shipments for commercial jet aircraft [3]	
								1962	1963
	1963 [1]								
Month:									
January	15,567	5.6	171	625	106	26,103	22,552	4,765	6,444
February	14,943	5.9	126	393	172	22,400	18,993	4,488	5,578
March	14,428	5.4	71	566	50	23,216	14,199	5,103	6,238
April	13,461	5.4	89	722	23	27,344	10,121	5,312	6,339
May	11,840	4.5	46	588	43	29,578	10,197	5,790	6,231
June	11,610	4.4	68	861	8	32,285	9,824	5,731	6,099
July	12,834	4.6	73	979	51	35,246	10,874	5,912	6,554
August	12,445	4.4	65	848	30	36,214	12,360	5,866	6,561
September	12,163	4.6	43	896	12	35,978	13,326	5,693	6,212
October	14,709	5.5	148	776	19	39,118	12,474	6,064	6,822
November	14,659	5.6	100	682	24	39,131	15,404	5,717	6,205
December	16,046	5.8	141	706	20	34,102	21,902	5,693	6,190
Total	164,705	5.1	1,141	8,642	558	34,102	172,226	66,134	75,473
District:									
East Coast	14,993	3.3	----	5,787	75	12,262			
Appalachian No. 1	1,337	3.5	----			674			
Appalachian No. 2	1,976	5.4	----	----		468			
Indiana, Illinois, Kentucky, etc.	33,012	5.8	----	----	11	6,210			
Minnesota, Wisconsin, North Dakota, etc.	1,997	4.1	----	----		1,685			
Oklahoma, Kansas, etc.	5,269	1.9	----	----		1,360	(4)	47,045	54,770
Texas Inland	4,509	4.0	310	20	428	597			
Texas Gulf Coast	53,362	7.2	90			4,304			
Louisiana Gulf Coast	25,942	9.0	419			1,695			
Arkansas, Louisiana Inland, etc.	1,729	3.9	303			1,788			
New Mexico	167	1.7	19			70			
Rocky Mountain	2,304	2.1	----	----	----	433			
West Coast	18,108	3.9	----	2,835	44	2,556	(4)	19,089	20,703
Total	164,705	5.1	1,141	8,642	558	34,102	172,226	66,134	75,473

[1] Preliminary figures.
[2] Production, stocks, and demand for 1963 are not strictly comparable to 1962 due to product reclassification resulting from separately reporting data for petrochemical feedstocks. Stocks on a new basis for comparison with 1963 were 32,398,000 barrels.
[3] Included in total demand for kerosine.
[4] Not available.

Tanker rates for kerosine from the gulf coast to U.S. destinations north of Cape Hatteras in 1963 averaged 42.4 cents per barrel compared with 37.0 cents in 1962.

The average posted prices of kerosine at Oklahoma refineries in 1963 was 10.9 cents per gallon. The average posted price on barges in New York Harbor for 1963 was 10.4 cents per gallon.

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TABLE 57.—Consumption of kerosine in the United States, 1962–63, by PAD districts, States, and uses

(Thousand barrels)

District and State	Range oil		Tractor fuel		All other uses		Total	
	1962	1963	1962	1963	1962	1963	1962	1963
District 1:								
Connecticut	1,390	1,282			380	88	1,689	1,370
Delaware	904	883	3		65	25	972	908
District of Columbia	114	132	3		27	3	144	135
Florida	3,510	4,099	86	76	493	431	4,089	4,606
Georgia	831	884	103	81	375	333	1,309	1,298
Maine	2,437	2,532		3	85	94	2,522	2,629
Maryland	2,715	2,422	16	1	131	64	2,862	2,487
Massachusetts	5,108	4,422			205	224	5,313	4,646
New Hampshire	912	883			19	14	931	897
New Jersey	1,950	1,861	10	6	236	264	2,196	2,131
New York	5,286	4,958	14	19	421	434	5,721	5,411
North Carolina	12,501	11,617	82	64	1,515	1,484	14,098	13,165
Pennsylvania	3,289	3,151	39	26	358	357	3,686	3,534
Rhode Island	799	719			68	44	867	763
South Carolina	4,148	3,666	8	4	578	532	4,734	4,202
Vermont	880	709		13	17		897	722
Virginia	5,476	5,380	47	36	201	211	5,724	5,627
West Virginia	212	216	3		35	13	250	229
Total	52,381	49,816	414	329	5,209	4,615	58,004	54,760
District 2:								
Illinois	4,114	4,300	73	26	816	1,195	5,003	5,521
Indiana	3,520	3,040	5	7	826	786	4,351	3,833
Iowa	1,954	2,083	17	19	115	135	2,086	2,237
Kansas	290	266	34		106	110	430	376
Kentucky	964	1,020	2		358	218	1,324	1,238
Michigan	4,781	4,466	26	36	2,166	1,458	6,973	5,960
Minnesota	2,148	2,126	19	14	134	239	2,301	2,379
Missouri	1,241	958	31	22	236	104	1,508	1,084
Nebraska	478	315	32	15	99	113	609	443
North Dakota	850	902			10	9	860	911
Ohio	2,455	2,665	5	8	830	663	3,290	3,336
Oklahoma	173	309	34	11	178	180	385	500
South Dakota	874	883		2	22	19	896	904
Tennessee	1,322	1,402	2	5	950	852	2,274	2,259
Wisconsin	2,664	2,398	10	5	85		2,759	2,403
Total	27,828	27,133	290	170	6,931	6,081	35,049	33,384
District 3:								
Alabama	218	316	26	25	78	119	322	460
Arkansas	61	121	7	19	57	61	125	201
Louisiana	85	271	5	16	199	210	289	497
Mississippi	54	88	15	13	104	72	173	173
New Mexico	50	110	2	1	78	54	130	165
Texas	453	584	84	131	918	1,330	1,455	2,045
Total	921	1,490	139	205	1,434	1,846	2,494	3,541
District 4:								
Colorado	131	242	1	2	37	35	169	279
Idaho	265	260			6	7	271	267
Montana	262	345			3	3	265	348
Utah	308	337			21	35	329	372
Wyoming	81	89	1		27	11	109	100
Total	1,047	1,273	2	2	94	91	1,143	1,366
District 5:								
Alaska	3	6			21	22	24	28
Arizona	14	10	1		10	4	25	14
California	182	118			812	741	994	859
Hawaii	41	34			14	14	55	48
Nevada	4				5	3	9	3
Oregon	11	5			15	15	26	20
Washington	12	4			31	34	43	38
Total	267	177	1		908	833	1,176	1,010
Total United States	82,444	79,889	846	706	14,576	13,466	97,866	94,061

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TABLE 58.—Monthly average refinery and terminal prices of kerosine including No. 1 fuel oil in the United States, 1962–63, in cents per gallon

Year and area	January	February	March	April	May	June	July
1962:							
No. 1 range oil at Chicago district	11.85	11.92	11.71	11.65	11.45	11.43	11.43
No. 1 fuel oil at Oklahoma	11.18	11.53	10.96	10.88	10.67	10.38	10.38
Kerosine (and/or No. 1 fuel oil) at New York Harbor (cargo)	11.80	11.79	11.50	11.17	10.93	10.75	10.75
Kerosine (and/or No. 1 fuel oil) at Tampa	12.10	12.10	12.10	11.74	11.49	11.10	11.10
1963:							
No. 1 range oil at Chicago district	11.92	11.93	11.90	11.71	11.43	11.37	11.18
No. 1 fuel oil at Oklahoma	10.69	11.13	11.08	11.00	10.94	10.88	10.88
Kerosine (and/or No. 1 fuel oil) at New York Harbor (cargo)	11.64	11.50	11.44	11.28	10.52	10.50	10.50
Kerosine (and/or No. 1 fuel oil) at Tampa	12.05	12.10	12.10	12.10	11.68	11.60	11.60

Year and area	August	September	October	November	December	Average for year
1962:						
No. 1 range oil at Chicago district	11.43	11.43	11.43	11.62	11.68	11.58
No. 1 fuel oil at Oklahoma	10.38	10.38	10.38	10.38	10.50	10.66
Kerosine (and/or No. 1 fuel oil) at New York Harbor (cargo)	10.75	10.75	10.75	11.15	11.50	11.13
Kerosine (and/or No. 1 fuel oil) at Tampa	11.10	11.10	11.10	11.10	11.84	11.50
1963:						
No. 1 range oil at Chicago district	11.18	11.18	11.41	11.29	11.44	11.49
No. 1 fuel oil at Oklahoma	10.88	10.88	10.88	10.88	10.88	10.91
Kerosine (and/or No. 1 fuel oil) at New York Harbor (cargo)	10.40	10.25	10.29	10.40	10.84	10.80
Kerosine (and/or No. 1 fuel oil) at Tampa	11.60	11.60	11.60	11.60	11.60	11.77

Source: Platt's Oil Price Handbook.

DISTILLATE FUEL OIL

The total demand for distillate fuel oil in 1963 was 762,193,000 barrels. This included a domestic demand of 747,221,000 and exports of 14,972,000 barrels. That domestic demand increased 2 percent for the year can be attributed to an exceptional increase in the demand for the third quarter (10 percent). The gain for the first half of the year was less than 1 percent, and the fourth quarter, which was much warmer than normal, showed no gain.

Refineries increased the production of distillate fuel oil in 1963 by 44,893,000 barrels. The production at natural gas liquids plants declined, as did imports and direct transfers from crude oil, so the total new supply for the year was 774,909,000 barrels, or 41,793,000 barrels more than in 1962. The new supply exceeded demand in 1963 and resulted in a stock increase of 12,716,000 barrels for the year.

The average wholesale price for distillate fuel oils in 1963 was 9.18 cents per gallon compared with 9.11 cents in 1962.

The tanker rate for No. 2 distillate fuel oil from the gulf coast to New York Harbor averaged 44.5 cents per barrel in 1963, compared with 39.1 cents for 1962.

Pipeline deliveries of distillate fuel oil increased 4.7 percent in 1963 to 276,927,000 barrels. Tidewater shipments from the gulf coast to the east coast increased about 10 percent, but shipments from the west coast to the east coast were almost 50 percent below the 1962 level.

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TABLE 59.—Salient statistics of distillate fuel oil in the United States, 1962–63, by months and refinery districts

(Thousand barrels unless otherwise stated)

Month and district	1962							
	Production from crude [1]	Yield (percent)	Production from natural gas liquids	Crude used directly as distillate [1]	Imports	Exports	Stocks (end of period) [2]	Domestic demand [1]
Month:								
January	68,406	25.5	48	217	2,420	834	121,041	101,234
February	61,151	25.1	40	147	727	720	99,952	82,434
March	62,080	23.9	43	173	685	872	86,497	75,564
April	54,323	22.7	43	115	1,514	466	88,310	53,716
May	57,503	22.3	42	66	1,457	454	102,317	44,607
June	58,464	22.5	38	69	986	347	121,496	40,031
July	59,312	22.0	41	64	889	409	140,630	40,763
August	58,951	22.2	36	68	453	553	163,025	36,560
September	58,136	22.6	43	73	1,015	869	176,192	44,393
October	59,249	23.0	42	73	690	533	185,222	51,329
November	57,311	22.9	40	65	533	988	170,221	71,962
December	64,704	24.0	41	68	462	1,179	144,505	89,812
Total	719,590	23.2	497	1,198	11,831	8,224	[3] 144,505	732,405
District:								
East Coast	121,213	27.2	--------	--------	9,811	75	50,077	[4]
Appalachian No. 1	8,523	22.8	--------	--------			3,667	
Appalachian No. 2	6,302	17.5	--------	--------			1,810	
Indiana, Illinois, Kentucky, etc.	117,200	21.5	--------	503	31	163	22,612	
Minnesota, Wisconsin, etc.	10,941	23.4	--------	169			8,210	
Oklahoma, Kansas, etc.	65,980	24.3	--------	136			12,196	
Texas Inland	19,785	17.1	230	71			1,824	
Texas Gulf Coast	192,861	27.5	80	57			16,893	
Louisiana Gulf Coast	63,910	23.4	11	35	1,892	1,002	7,268	
Arkansas, Louisiana Inland, etc.	9,371	21.9	176	9			2,409	
New Mexico	1,575	16.8	--------	41			179	
Rocky Mountain	24,531	22.1	--------	87	92	33	2,709	
West Coast	77,398	16.7	--------	--------	5	6,951	14,651	
Total	719,590	23.2	497	1,198	11,831	8,224	[3] 144,505	732,405

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TABLE 59—Salient statistics of distillate fuel oil in the United States, 1962–63, by months and refinery districts—Continued

(Thousand barrels unless otherwise stated)

Month and district	1963[4]							
	Production from crude[1]	Yield (percent)	Production from natural gas liquids	Crude used directly as distillate[2]	Imports	Exports	Stocks (end of period)[1]	Domestic demand[1]
Month:								
January	70,790	25.8	45	77	1,115	1,092	111,674	103,222
February	66,598	26.3	42	72	809	2,989	87,812	88,394
March	68,407	25.4	33	94	623	1,145	83,913	71,911
April	57,234	23.0	36	66	606	1,219	91,718	48,918
May	60,155	23.0	38	61	606	1,170	103,160	48,248
June	60,073	22.6	34	63	711	1,012	123,364	39,665
July	62,319	22.5	44	62	714	972	145,239	40,292
August	63,309	22.8	39	64	631	1,124	165,188	42,970
September	63,117	23.7	34	61	678	1,390	177,231	50,457
October	63,824	23.8	45	61	867	1,125	191,394	49,509
November	62,858	23.9	44	57	956	1,296	192,561	61,452
December	65,799	23.8	36	69	833	438	156,677	102,183
Total	764,483	23.9	470	807	9,149	14,972	156,677	747,221
District:								
East Coast	129,264	28.3	[3]		7,826	1,106	58,026	
Appalachian No. 1	9,108	23.6					3,775	
Appalachian No. 2	7,310	19.8					1,803	
Indiana, Illinois, Kentucky, etc.	123,297	21.7		198	63	53	26,774	
Minnesota, Wisconsin, etc	11,220	2.8		182			7,762	
Oklahoma, Kansas, etc	68,465	25.3		122			14,166	
Texas Inland	19,448	17.0	232	90			2,143	[3]
Texas Gulf Coast	208,686	28.1	69	50			16,727	
Louisiana Gulf Coast	74,098	25.8	2	31	1,250	4,202	5,409	
Arkansas, Louisiana Inland, etc.	9,966	22.2	167				3,448	
New Mexico	1,597	16.0		57			180	
Rocky Mountain	24,545	21.8		77	1	19	2,587	
West Coast	77,479	16.5			9	9,592	13,877	
Total	764,483	23.9	470	807	9,149	14,972	156,677	747,221

[1] Preliminary data.
[2] Figures represent crude oil used as fuel on pipelines, which is considered part of the demand for distillate.
[3] Production, stocks, and demand for 1963 are not strictly comparable to 1962 due to product reclassification resulting from separately reporting data for petrochemical feedstocks. Stocks on a new basis for comparison with 1963 were 143,961,000 barrels.
[4] Not available.

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TABLE 60.—Consumption of distillate fuel oil[1] in the United States, by uses

(Thousand barrels)

Uses	1959	1960	1961	1962	1963	Percent change
Heating oils	401,368	422,855	434,805	450,031	449,159	−0.2
Range oil (No. 1 fuel oil)	14,153	15,155	15,487	16,799	16,156	−3.8
Industrial (excluding oil company)	33,380	34,271	31,226	34,951	36,647	4.9
Oil company (excluding heating oil)	8,642	8,347	8,743	9,055	10,253	13.2
Gas and electric public utility power-plants	5,005	4,742	4,151	4,100	4,149	1.2
Railroads	87,802	86,490	85,180	86,803	88,117	1.5
Bunkering of vessels (including company tankers but excluding military)	19,250	18,730	14,566	15,836	15,148	−4.4
Military (U.S. Army, Navy, Air Force, and Marine Corps)	11,394	10,793	11,484	13,041	13,436	3.0
Miscellaneous uses:						
Diesel fuel	70,527	74,562	77,825	89,729	106,341	18.5
Other light distillates	7,471	7,380	7,407	8,750	8,718	−0.4
Total United States	658,992	683,325	690,874	729,095	748,124	2.6

[1] Includes diesel fuel.

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TABLE 61.—Consumption of distillate fuel oil[1] in the United States by PAD districts and States

(Thousand barrels)

District and State	1959	1960	1961	1962	1963
District 1:					
Connecticut	22,176	23,230	23,199	23,099	22,906
Delaware	2,487	2,723	2,537	3,097	3,474
District of Columbia	2,719	2,914	2,726	2,878	2,872
Florida	8,190	8,971	9,369	10,611	10,902
Georgia	4,731	5,117	5,269	6,218	6,969
Maine	7,108	7,456	8,307	8,645	9,487
Maryland	12,495	13,101	14,257	15,146	16,014
Massachusetts	47,781	51,022	52,266	53,448	51,664
New Hampshire	4,049	4,484	5,486	5,834	6,327
New Jersey	45,634	45,542	46,992	48,622	51,466
New York	79,499	81,677	86,029	94,501	95,856
North Carolina	11,544	13,353	13,366	15,617	16,000
Pennsylvania	44,029	45,668	45,982	49,315	51,702
Rhode Island	7,167	8,093	7,547	7,411	7,391
South Carolina	4,454	5,203	5,116	5,776	6,169
Vermont	2,399	2,939	3,299	3,602	3,787
Virginia	12,984	14,184	14,631	15,843	16,945
West Virginia	2,154	2,462	2,525	2,490	2,622
Total	321,600	338,139	348,903	372,153	382,553
District 2:					
Illinois	43,008	42,490	42,255	41,361	41,421
Indiana	24,500	25,596	25,452	25,743	25,934
Iowa	11,360	11,141	10,043	11,022	11,106
Kansas	5,060	4,751	5,187	5,242	5,612
Kentucky	5,800	4,833	4,426	5,822	5,532
Michigan	28,387	30,464	30,547	31,131	30,471
Minnesota	15,079	16,241	15,967	16,776	16,629
Missouri	12,700	12,830	12,858	13,412	13,939
Nebraksa	3,929	4,183	4,481	4,099	4,387
North Dakota	3,632	3,775	3,693	4,472	4,584
Ohio	24,850	23,836	23,433	24,250	26,348
Oklahoma	2,603	2,631	3,152	3,243	3,729
South Dakota	2,882	2,964	3,085	3,212	3,370
Tennessee	5,037	5,268	5,552	6,167	6,706
Wisconsin	20,316	21,711	22,153	23,399	23,461
Total	209,143	212,714	212,284	219,351	223,229
District 3:					
Alabama	4,891	5,370	4,310	4,938	5,148
Arkansas	2,175	2,052	3,078	2,451	2,579
Louisiana	11,249	10,694	9,038	9,622	9,762
Mississippi	2,318	2,364	1,954	2,715	2,885
New Mexico	2,302	3,065	2,841	3,512	3,642
Texas	26,541	24,315	21,795	23,959	24,092
Total	49,476	47,860	43,016	47,197	48,108
District 4:					
Colorado	3,099	4,225	4,441	4,148	4,581
Idaho	3,734	4,055	4,037	4,204	4,108
Montana	4,474	4,877	5,248	5,522	5,400
Utah	3,478	3,841	3,085	3,607	3,640
Wyoming	3,539	3,258	3,250	3,838	3,815
Total	18,324	20,256	20,061	21,319	21,544
District 5:					
Alaska	2,618	2,616	2,849	2,897	3,076
Arizona	2,100	2,774	3,107	3,001	3,520
California	26,357	26,697	27,410	29,685	32,256
Hawaii	(2)	876	1,666	1,641	1,375
Nevada	2,051	2,428	2,985	3,017	2,844
Oregon	10,456	10,920	11,061	11,777	12,828
Washington	16,867	18,045	17,532	17,057	16,791
Total	60,449	64,356	66,610	69,075	72,690
Total United States	658,992	683,325	690,874	729,095	748,124

[1] Includes diesel fuel oil.
[2] Not included in U.S. totals before 1960.

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TABLE 62.—Monthly average prices of distillate fuel oil and diesel fuel in the United States, 1962–63

Year and grade	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
1962:													
No. 2 fuel oil at refineries, Oklahoma----cents per gallon	10.18	10.53	9.96	9.88	9.63	9.38	9.38	9.38	9.38	9.38	9.38	9.50	9.66
No. 2 fuel oil at New York Harbor----do	10.80	10.79	10.50	10.17	9.93	9.75	9.75	9.75	9.75	9.75	10.15	10.50	10.13
Diesel oil, shore plants, New York----do	11.15	11.14	10.85	10.53	10.29	10.10	10.10	10.10	10.10	10.10	10.50	10.85	10.48
Diesel oil for ships:													
New York----dollars per barrel	4.73	4.72	4.60	4.33	4.18	4.18	4.18	4.18	4.18	4.18	4.37	4.60	4.37
New Orleans----do	4.27	4.27	4.27	4.20	4.06	4.06	4.06	4.06	4.06	4.06	4.06	4.26	4.14
San Pedro----do	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09
1963:													
No. 2 fuel oil at refineries, Oklahoma----cents per gallon	9.69	10.13	10.08	10.00	9.92	9.88	9.88	9.88	9.88	9.88	9.88	9.88	9.91
No. 2 fuel oil at New York Harbor----do	10.53	10.50	10.44	10.28	9.52	9.50	9.50	9.40	9.25	9.29	9.40	9.99	9.80
Diesel oil, shore plants, New York----do	10.87	10.41	10.41	10.83	9.87	9.85	9.85	9.85	9.85	9.85	9.85	10.20	10.14
Diesel oil for ships:													
New York----dollars per barrel	4.39	4.37	4.37	4.36	3.96	3.95	3.95	3.95	3.95	3.95	3.95	4.13	4.11
New Orleans----do	4.15	4.16	4.16	4.16	3.95	3.95	3.95	3.95	3.95	3.95	3.95	3.95	4.02
San Pedro----do	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09	5.09

Source: Platt's Oil Price Handbook.

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RESIDUAL FUEL OIL

The total demand for residual fuel oil in 1963 was 556,622,000 barrels. This includes a domestic demand of 541,341,000 barrels, and 15,281,000 barrels exported. Total demand declined 0.4 percent for the year and domestic demand was down 0.8 percent, but exports increased 18.9 percent.

The supply of residual fuel oil available from domestic sources declined sharply in 1963, and additional imports were needed to meet demand requirements. The refinery output of residual declined at the rate of 52,000 barrels daily in 1963 and imports increased from 724,000 barrels daily in 1962 to 752,000 in 1963. Imports subject to quota regulations of the Oil Imports Administration totaled 567,000 barrels daily in 1963 compared with 524,000 barrels for 1962. Residual fuel oil imported in bond for use as bunker fuel for vessels engaged in foreign trade, imports by the military for offshore use, imports from Puerto Rico, and overland receipts from Canada and Mexico are exempt from the quota regulations.

Residual fuel oil shipments from the gulf coast to PAD District 1 continued to decline, and for the year totaled 31,638,000 barrels (7,706,000 less than last year).

The average tanker rate for Bunker "C" fuel oil from the gulf coast to destinations north of Cape Hatteras was 50.3 cents per barrel in 1963 compared with 42.8 cents in 1962.

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TABLE 63.—Salient statistics of residual fuel oil in the United States, 1962–63, by months and refinery districts

(Thousand barrels unless otherwise stated)

Month and district	1962							1963 [1]						
	Production	Yield (percent)	Crude used directly as residual [2]	Imports	Exports	Stocks (end of month)	Domestic demand	Production [3]	Yield (percent)	Crude used directly as residual [2]	Imports	Exports	Stocks (end of month) [3]	Domestic demand [3]
Month:														
January	30,371	11.3	423	31,833	1,213	41,605	64,678	28,169	10.2	266	34,484	814	46,896	64,984
February	26,543	11.0	425	23,484	1,604	39,457	50,996	25,334	10.0	251	30,332	1,477	43,627	57,709
March	26,862	10.4	303	26,763	1,388	37,127	54,870	25,406	9.4	246	23,977	1,060	42,867	49,329
April	22,897	9.5	305	20,404	1,011	39,267	40,455	21,481	8.6	269	24,780	1,315	44,685	43,397
May	23,312	9.0	358	18,887	1,454	40,976	38,894	21,000	8.1	264	19,073	1,338	46,648	37,036
June	22,219	8.6	283	16,781	820	44,891	34,548	21,811	8.2	285	15,330	967	48,100	35,007
July	23,208	8.6	291	17,420	1,010	50,662	34,138	21,748	7.8	251	18,132	1,123	50,885	36,223
August	22,893	8.6	290	16,117	1,050	54,065	34,827	21,795	7.8	295	16,909	1,358	52,456	36,070
September	23,139	8.9	248	18,253	837	56,513	39,213	21,521	8.1	264	15,748	1,719	52,624	35,646
October	22,490	8.8	280	19,482	618	54,077	43,232	21,031	7.8	273	23,191	959	54,389	41,801
November	23,584	9.4	301	25,450	939	51,154	51,319	22,501	8.6	259	20,749	1,829	52,250	43,789
December	28,161	10.4	290	29,940	906	49,996	58,643	24,969	9.1	382	31,609	1,322	47,538	60,350
Total	295,679	9.6	3,797	264,314	12,850	[3] 49,996	545,913	276,766	8.6	3,305	274,314	15,281	47,538	541,341
District:														
East Coast	53,451	12.1	190	237,565	42	9,957	[4]	41,165	8.9	26	254,346	68	10,318	[4]
Appalachian No. 1	3,759	10.1	----------			419		3,882	10.1	----------			347	
Appalachian No. 2	3,576	10.0	----------			235		3,431	9.3	----------			259	
Indiana, Illinois, Kentucky, etc	51,211	9.4	228	610	171	5,999		51,295	9.0	197	800	168	6,518	
Minnesota, Wisconsin, etc	6,266	13.3	36			837		6,209	12.7	39			595	
Oklahoma, Kansas, etc	7,271	2.7	360			960		6,124	2.2	360			856	
Texas Inland	5,851	5.1	341			2,620		4,642	4.1	341			2,339	
Texas Gulf Coast	36,609	5.2	524			3,938		35,744	4.8	516			3,581	
Louisiana Gulf Coast	15,341	5.6	641	11,775	1,895	1,359		14,378	5.0	635	12,327	4,012	1,162	
Arkansas, Louisiana Inland, etc	1,958	4.6	201			145		2,205	4.9	200			150	
New Mexico	781	8.4	83			27		671	6.7	83			23	
Rocky Mountain	14,197	12.9	323	47	2	902		13,614	12.1	276	26	1	786	
West Coast	95,408	20.5	870	14,317	10,740	22,598		93,406	19.9	632	6,815	11,032	20,604	
Total	295,679	9.6	3,797	264,314	12,850	[3] 49,996	545,813	276,766	8.6	3,305	274,314	15,281	47,538	541,341

[1] Preliminary data.
[2] Represents crude oil used as fuel on leases and for general industrial purposes.
[3] Production, stocks, and domestic demand for 1963 are not strictly comparable to 1962 due to reclassification from separately reporting data for petrochemical feedstocks. Stocks on a new basis for comparison with 1963 were 49,775,000 barrels.
[4] Not available.

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TABLE 64.—Consumption of residual fuel oil [1] in the United States, by uses

(Thousand barrels)

	1959	1960	1961	1962	1963	Percent change
Heating oils	111,850	125,088	121,097	125,164	125,248	0.1
Industrial (excluding oil company fuel)	167,701	157,270	153,766	156,221	149,269	−4.5
Oil-company use (excluding heating oil)	46,177	45,061	44,399	45,978	46,976	2.2
Gas and electric public utility powerplants	82,208	85,408	87,881	88,261	91,615	3.8
Railroads	5,613	5,610	5,347	5,501	5,342	−2.9
Bunkering of vessels (including company tankers but excluding military)	102,049	94,084	87,308	84,415	76,502	−9.4
Military use (U.S. Army, Navy, Air Force, and Marine Corps)	31,415	31,724	36,762	35,667	36,444	2.2
Miscellaneous uses	7,339	6,291	6,426	7,226	7,126	−1.4
Total United States	554,352	550,536	542,986	548,433	538,522	−1.8

[1] Includes Navy grade and crude oil burned as fuel.

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TABLE 65.—Consumption of residual fuel oil [1] in the United States, by PAD districts and States

(Thousand barrels)

District and State	1959	1960	1961	1962	1963
District 1:					
Connecticut	15,814	14,450	14,549	16,019	16,260
Delaware	7,063	6,081	4,986	4,775	4,707
District of Columbia	2,450	2,387	1,955	2,243	2,533
Florida	33,310	28,978	32,600	37,044	36,668
Georgia	6,824	6,413	5,048	5,285	5,663
Maine	6,433	5,742	6,366	5,985	5,332
Maryland	17,385	16,490	12,955	13,751	13,270
Massachusetts	35,532	38,942	40,242	41,852	37,693
New Hampshire	2,984	2,324	2,067	2,545	2,524
New Jersey	41,422	42,791	42,990	50,422	50,539
New York	79,784	76,586	83,518	89,667	88,606
North Carolina	3,908	4,537	4,738	3,725	3,318
Pennsylvania	45,660	42,731	38,970	41,422	42,245
Rhode Island	10,350	9,502	7,543	8,274	8,177
South Carolina	4,886	4,634	5,031	5,908	5,833
Vermont	275	498	540	629	607
Virginia	17,703	17,448	14,195	13,225	14,055
West Virginia	1,620	1,451	1,216	1,480	1,572
Total	333,403	321,985	319,509	344,251	339,602
District 2:					
Illinois	23,689	25,893	25,750	24,756	25,582
Indiana	13,035	12,885	11,988	10,736	10,756
Iowa	1,088	1,021	1,032	873	931
Kansas	1,943	2,249	1,433	1,533	1,565
Kentucky	570	321	278	389	460
Michigan	13,498	11,242	9,896	9,275	9,746
Minnesota	6,399	6,363	5,524	6,307	6,102
Missouri	3,129	3,026	2,638	2,131	2,335
Nebraska	218	378	419	626	1,133
North Dakota	597	663	552	524	553
Ohio	11,028	11,382	9,023	8,227	7,790
Oklahoma	1,319	1,396	873	967	797
South Dakota	48	60	36	152	245
Tennessee	284	184	171	105	275
Wisconsin	4,167	4,275	4,028	3,813	4,110
Total	81,012	81,338	73,641	70,414	72,380
District 3:					
Alabama	4,178	4,202	3,555	2,749	3,184
Arkansas	346	474	379	566	864
Louisiana	10,764	8,599	8,537	6,563	6,653
Mississippi	435	339	338	474	878
New Mexico	107	173	311	323	209
Texas	25,275	22,102	21,437	18,711	17,485
Total	41,105	35,889	34,557	29,386	29,273
District 4:					
Colorado	1,603	1,790	2,465	2,497	2,572
Idaho	185	201	422	223	260
Montana	2,006	2,022	2,533	3,049	2,836
Utah	5,872	5,562	5,654	6,048	5,790
Wyoming	1,842	1,738	2,555	3,288	2,490
Total	11,508	11,313	13,629	15,105	13,948
District 5:					
Alaska	574	695	641	715	742
Arizona	34	95	94	117	60
California	72,287	78,774	81,587	68,949	62,842
Hawaii	(2)	5,613	6,646	6,716	6,940
Nevada	146	202	258	165	180
Oregon	5,121	5,453	4,879	4,989	4,930
Washington	9,162	9,179	7,545	7,626	7,625
Total	87,324	100,011	101,650	89,277	83,319
Total United States	554,352	550,536	542,986	548,433	538,522

[1] Includes some crude oil burned as fuel.
[2] Not included in U.S. totals before 1960.

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TABLE 66.—Monthly average prices of residual fuel oil in the United States, 1962–63 (in dollars per barrel)

Year and grade	January	February	March	April	May	June	July	August	September	October	November	December	Average for year
1962:													
No. 6 fuel oil at refineries, Oklahoma	1.86	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
No. 5 fuel oil at New York Harbor	3.12	3.12	3.05	2.86	2.75	2.74	2.74	2.74	2.74	2.74	2.79	2.85	2.85
Bunker "C" for ships:													
New York	2.52	2.52	2.51	2.50	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.45	2.47
New Orleans	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
San Pedro	2.23	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.29
1963:													
No. 6 fuel oil at refineries, Oklahoma	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90	1.90
No. 5 fuel oil at New York Harbor	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.85	2.87	2.85
Bunker "C" for ships:													
New York	2.31	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30	2.30
New Orleans	2.20	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19	2.19
San Pedro	2.30	2.30	2.30	2.30	2.30	2.21	2.20	2.20	2.20	2.20	2.20	2.20	2.24

Source: Platt's Oil Price Handbook.

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LUBRICANTS

The domestic demand for lubricants in 1963 was slightly below the 1962 level; however, exports increased 3.7 percent and total demand for the year was up 1.0 percent.

Table 67 in this chapter has been expanded to show production and stock data for lubricating oils by grades.

There were no changes in the posted prices of lubricating oils in 1963.

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TABLE 67.—Salient statistics of lubricants in the United States, by months and districts

(Thousand barrels unless otherwise stated)

Month and district	1962											
	Production				Yield (percent)	Imports (all types)	Exports (all types)	Stocks, end of period				Domestic demand (all types)
	Bright stock	Neutral	Other grades	Total				Bright stock	Neutral	Other grades	Total	
By months:												
January	548	1,874	2,597	5,019	1.9	1	1,336	1,253	3,914	7,966	13,133	3,494
February	552	1,860	2,315	4,727	1.9	1	942	1,303	4,053	8,035	13,391	3,528
March	569	1,655	2,738	4,962	2.0	1	1,160	1,387	3,992	8,252	13,631	3,563
April	572	1,931	2,759	5,262	2.2	2	1,805	1,381	3,818	8,083	13,282	3,808
May	514	1,811	2,701	5,026	2.0	1	1,656	1,162	3,465	8,045	12,672	3,981
June	695	1,831	2,555	5,081	2.0	1	1,539	1,137	3,177	8,149	12,463	3,752
July	554	2,036	2,703	5,293	1.9	1	1,623	993	3,278	8,219	12,490	3,644
August	597	1,768	2,681	5,046	1.9	1	1,533	985	3,059	8,132	12,176	3,828
September	550	1,882	2,897	5,329	2.1	4	1,858	1,053	2,988	8,139	12,180	3,471
October	612	2,016	2,696	5,324	2.1	9	1,011	1,103	3,256	8,239	12,598	3,904
November	532	2,062	2,377	4,971	1.9	4	1,403	1,043	3,333	8,170	12,546	3,624
December	737	2,039	2,651	5,427	2.0	2	1,827	1,260	3,539	8,331	13,130	3,018
Total	7,032	22,765	31,670	61,467	2.0	28	17,693	1,260	3,539	8,331	13,130	43,615
By districts:												
East Coast	1,110	3,017	3,802	7,929	1.8	16		206	525	2,278	3,009	
Appalachian No. 1	1,121	1,434	723	3,278	8.7			151	351	231	733	
Appalachian No. 2		286	141	427	1.2			3	23	108	134	
Indiana, Illinois, Kentucky, etc	777	3,640	222	4,639	.8	2		96	536	1,218	1,850	
Minnesota, Wisconsin, etc										28	28	
Oklahoma, Kansas, etc	729	2,372	1,728	4,829	1.7			108	279	205	592	
Texas Inland			156	156	.2		16,116			41	41	(1)
Texas Gulf Coast	1,695	4,579	18,002	24,276	3.4			277	678	2,674	3,629	
Louisiana Gulf Coast	910	4,644	1,676	7,230	2.7	8		82	480	313	875	
Arkansas, Louisiana Inland, etc		70	1,880	1,950	4.6				3	381	384	
New Mexico										1	1	
Rocky Mountain	42	213	57	312	.3			5	67	37	109	
West Coast	648	2,510	3,283	6,441	1.4	2	1,577	332	597	816	1,745	
Total	7,032	22,765	31,670	61,467	2.0	28	17,693	1,260	3,539	8,331	13,130	43,615

See footnotes at end of table.

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TABLE 67.—Salient statistics of lubricants in the United States, by months and districts—Continued

(Thousand barrels unless otherwise stated)

Month and district	1963[1]											
	Production				Yield (percent)	Imports (all types)	Exports (all types)	Stocks, end of period				Domestic demand (all types)
	Bright stock	Neutral	Other grades	Total				Bright stock	Neutral	Other grades	Total	
By months:												
January	653	2,038	2,419	5,110	1.9	----	1,129	1,359	3,548	8,445	13,343	3,768
February	599	1,981	2,264	4,844	1.9	2	1,349	1,570	3,698	8,515	13,783	3,057
March	582	2,181	2,359	5,122	1.9	3	1,388	1,614	3,895	8,638	14,147	3,373
April	780	1,890	2,536	5,206	2.1	----	1,861	1,653	3,770	8,255	13,678	3,814
May	598	2,091	2,789	5,478	2.1	2	1,818	1,464	3,662	8,114	13,240	4,100
June	659	1,864	2,729	5,252	1.9	2	1,307	1,424	3,643	8,313	13,380	3,807
July	679	2,153	2,738	5,570	2.0	2	1,772	1,399	3,685	8,363	13,447	3,733
August	533	2,041	2,848	5,422	2.0	4	1,464	1,379	3,707	8,364	13,450	3,959
September	634	1,970	2,763	5,367	2.0	3	1,567	1,565	3,756	8,494	13,815	3,438
October	563	2,199	2,671	5,433	2.0	2	1,499	1,555	3,926	7,954	13,435	4,316
November	621	2,118	2,575	5,314	2.1	1	1,390	1,593	3,984	8,458	14,035	3,325
December	524	2,108	2,336	4,968	1.8	2	1,797	1,567	4,500	8,254	14,321	2,887
Total	7,425	24,634	31,027	63,086	2.0	23	18,341	1,567	4,500	8,254	14,321	43,577
By districts:												
East Coast	1,148	2,971	3,841	7,960	1.8	14		334	589	2,342	3,265	
Appalachian No. 1	1,212	1,459	644	3,315	8.6			237	328	271	836	
Appalachian No. 2	----	266	149	415	1.1			3	35	112	150	
Indiana, Illinois, Kentucky, etc	957	4,049	310	5,316	.9	6		74	616	1,198	1,888	
Minnesota, Wisconsin, etc	----	----	----	----	----			----	----	27	27	
Oklahoma, Kansas, etc	1,053	2,790	1,207	5,050	1.9		16,815	271	343	209	823	
Texas Inland	----	----	156	156	.2			----	----	39	39	(2)
Texas Gulf Coast	1,810	5,452	18,072	25,334	3.5			289	1,373	2,565	4,227	
Louisiana Gulf Coast	809	5,753	1,150	7,712	2.7	2		28	575	202	805	
Arkansas, Louisiana Inland, etc	----	96	1,820	1,916	4.3			----	10	352	362	
New Mexico	----	----	----	----	----			----	----	3	3	
Rocky Mountain	49	233	82	364	.3	1		8	58	47	113	
West Coast	387	1,565	3,596	5,548	1.1	----	1,526	323	573	887	1,783	
Total	7,425	24,634	31,027	63,086	2.0	23	18,341	1,567	4,500	8,254	14,321	43,577

[1] Preliminary figures.
[2] Figures not available.

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TABLE 68.—Average monthly refinery prices of 5 selected grades of lubricating oil in the United States, in cents per gallon

Year and grade	January	February	March	April	May	June
1962:						
Oklahoma:						
200 viscosity, No. 3 color, neutral	21.50	21.50	21.50	21.50	21.50	21.50
150–160 viscosity at 210° bright stock, 10–25 pour test	23.50	23.50	23.50	23.50	23.50	23.50
Pennsylvania:						
200 viscosity, No. 3 color, neutral 420–425 flash, 25 pour test	28.00	28.00	28.00	28.00	28.00	28.00
600 steam-refined, cylinder stock, filterable	21.93	22.00	22.00	22.00	22.00	22.00
South Texas: 500 viscosity, No. 2½–3½ color, neutral	20.00	20.00	20.00	20.00	20.00	20.00
1963:						
Oklahoma:						
200 viscosity, No. 3 color, neutral	21.50	21.50	21.50	21.50	21.50	21.50
150–160 viscosity at 210° bright stock, 10–25 pour test	24.50	24.50	24.50	24.50	24.50	24.50
Pennsylvania:						
200 viscosity, No. 3 color, neutral 420–425 flash, 25 pour test	28.00	28.00	28.00	28.00	28.00	28.00
600 steam-refined, cylinder stock, filterable	22.00	22.00	22.00	22.00	22.00	22.00
South Texas: 500 viscosity, No. 2½–3½ color, neutral	20.00	20.00	20.00	20.00	20.00	20.00

Year and grade	July	August	September	October	November	December	Average for year
1962:							
Oklahoma:							
200 viscosity, No. 3 color, neutral	21.50	21.50	21.50	21.50	20.63	21.50	20.59
150–160 viscosity at 210° bright stock, 10–25 pour test	23.50	23.50	23.50	23.50	23.57	24.50	23.59
Pennsylvania:							
200 viscosity, No. 3 color, neutral 420–425 flash, 25 pour test	28.00	28.00	28.00	28.00	28.00	28.00	28.00
600 steam-refined, cylinder stock, filterable	22.00	22.00	22.00	22.00	22.00	22.00	21.99
South Texas: 500 viscosity, No. 2½–3½ color, neutral	20.00	20.00	20.00	20.00	20.00	20.00	20.00
1963:							
Oklahoma:							
200 viscosity, No. 3 color, neutral	21.50	21.50	21.50	21.50	21.50	21.50	21.50
150–160 viscosity at 210° bright stock, 10–25 pour test	24.50	24.50	24.50	24.50	24.50	24.50	24.50
Pennsylvania:							
200 viscosity, No. 3 color, neutral 420–425 flash, 25 pour test	28.00	28.00	28.00	28.00	28.00	28.00	28.00
600 steam-refined, cylinder stock filterable	22.00	22.00	22.00	22.00	22.00	22.00	22.00
South Texas: 500 viscosity, No 2½–3½ color, neutral	20.00	20.00	20.00	20.00	20.00	20.00	20.00

Source: Platt's Oil Price Handbook.

JET FUEL (MILITARY GRADE)

The jet fuel included in this category represents that used by the military or by aircraft and missile manufacturers which are testing equipment for the U.S. Government.

The total demand for military-grade jet fuels in 1963 was 116,774,000 barrels, an increase of 3.8 percent for the year. Production declined 3.6 million barrels in 1963, so additional demand requirements were met by a 5.4-million-barrel increase in imports and a stock withdrawal of 1.1 million barrels.

Beginning with the 1963 data, production of military jet fuels are now reported by grades. The JP–4 grade is a wide-cut gasoline type; JP–5 is a high flashpoint kerosine type; and the other grades include special type jet, jet propellant, and rocket fuels blended to military specifications.

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TABLE 69.—Salient statistics of military jet fuel in the United States, by months and districts

(Thousand barrels)

Month and district	1962								1963 [1]							
	Production, blended from				Transfers from gasoline plants	Imports	Exports	Stocks, end of period	Domestic demand	Production [2]				Imports	Exports	Stocks, end of period	Domestic demand
	Gasoline	Kerosine	Distillate	Total						JP-4 grade [3]	JP-5 grade	Other military grades	Total				
By months:																	
January	6,041	961	562	7,564	41	1,702	-------	8,092	9,495	6,709	640	331	7,680	2,214	13	9,774	9,775
February	5,360	721	991	7,072	5	147	-------	8,057	7,259	6,300	400	393	7,093	536	20	8,979	8,404
March	6,286	1,148	1,187	8,621	112	1,164	1	8,317	9,636	6,979	1,071	309	8,359	133	9	9,792	7,670
April	6,409	1,004	1,215	8,628	24	479	1	8,505	8,942	6,697	1,200	298	8,195	863	32	9,287	9,531
May	6,843	1,232	1,116	9,191	64	526	1	8,251	10,034	7,156	1,147	295	8,598	2,637	10	9,628	10,884
June	6,541	1,206	1,207	8,954	99	1,274	1	8,162	10,415	7,412	1,181	359	8,952	283	10	10,180	8,673
July	6,213	1,280	867	8,360	95	171	-------	8,055	8,733	7,476	1,095	543	9,114	1,804	9	10,245	10,844
August	7,248	1,335	1,078	9,661	54	1,004	-------	8,656	10,118	7,351	1,174	377	8,902	2,329	12	9,619	11,845
September	6,618	1,238	927	8,783	57	2,535	34	8,405	11,592	6,885	1,212	444	8,541	1,331	11	9,310	10,170
October	6,723	1,702	981	9,406	65	475	10	9,413	8,928	6,641	590	603	7,834	2,403	13	8,589	10,945
November	6,610	1,610	961	9,181	64	513	10	10,768	8,393	7,110	881	345	8,336	1,078	39	8,912	9,052
December	4,988	1,236	624	6,848	25	907	24	9,668	8,856	6,473	850	433	7,756	679	15	8,544	8,788
Total	75,880	14,673	11,716	102,269	705	10,897	82	9,668	112,401	83,189	11,441	4,730	99,360	16,290	193	8,544	116,581
By districts:																	
East Coast	2,507	730	-------	3,237	-------	9,527		656		2,353	-------	220	2,573	13,667		473	
Appalachian No. 1	375	-------	-------	375	-------			26		318	-------	-------	318			9	
Appalachian No. 2	-------	335	-------	335	-------			84		97	92	-------	189	-------		156	
Indiana Illinois, Kentucky, etc	6,921	591	3,735	11,247	-------			956		9,132	337	1,821	11,290	-------		778	
Minnesota, Wisconsin, North and South Dakota	1,367	189	-------	1,556	-------	12		154		1,723	-------	217	1,940	-------		221	
Oklahoma, Kansas, Missouri, etc	9,406	2,006	2,569	13,981	-------		40	1,158	(4)	12,253	775	233	13,261	-------	65	1,090	(4)
Texas Inland	12,431	535	949	13,915	-------	-------		850		11,025	260	875	12,160	-------		604	
Texas Gulf	13,741	4,117	257	18,115	-------	-------		1,910		12,181	3,303	1,040	16,524	-------		1,066	
Louisiana, Gulf Coast	10,968	329	690	11,987	-------	-------		801		10,068	2,128	232	12,428	-------		1,167	
Arkansas, Louisiana Inland, etc	921	-------	52	973	705	-------		337		1,551	-------	92	1,643	-------		194	
New Mexico	1,117	326	-------	1,443	-------	-------		179		1,556	8	-------	1,564	-------		165	
Rocky Mountain	4,125	326	358	5,809	-------	-------		701		5,789	-------	-------	5,789	-------		611	
West Coast	12,001	4,689	2,606	19,296	-------	1,358	42	1,856		15,143	4,538	-------	19,681	2,623	128	2,010	
Total	75,880	14,673	11,716	102,269	705	10,897	82	9,668	112,401	83,189	11,441	4,730	99,360	16,290	193	8,544	116,581

[1] Preliminary figures.
[2] Production is now shown by grades. No comparable data for 1962 are available.
[3] Includes military jet fuel produced at natural gas liquid plants: Texas Gulf, 490 Arkansas, Louisiana Inland, etc., 566; total, 615.
[4] Figures not available.

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LIQUEFIED GASES (INCLUDING ETHANE)

Liquefied gases are derived from two sources. Those produced at refineries are called liquefied refinery gases to distinguish them from those extracted from natural gas, which are called liquefied petroleum gases. The liquefied petroleum gases are all saturated (that is, propane, butane, etc.). The liquefied refinery gases may contain unsaturated compounds or olefins (that is, propylene, butylene, etc.). The olefins are used as feed stock for chemical plants. The saturated gases may be used as chemical raw materials or as fuel. Beginning with 1963, separate data have been collected on liquefied refinery gas used as fuel and that used as raw material for petrochemical feedstocks. Liquefied gases are also used in producing gasoline and are reported in this chapter as natural gas liquids used at refineries or as gasoline. Although ethane and ethylene are not defined as liquefied gases, the statistics of these products are in some cases reported with those of LPG.

The production of liquefied gases, including ethane-ethylene, in 1963 was 301.7 million barrels. This includes 56.4 million produced at petroleum refineries and 245.3 million produced at natural-gas-processing plants. The total demand for liquefied gases in 1963 was 238.4 million barrels. This excludes 60.6 million barrels delivered from natural-gas-processing plants and terminals for blending into motor fuel.

More detailed information on liquefied gases may be found in the "Natural Gas Liquids" chapter.

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TABLE 70.—Salient statistics of liquefied petroleum gas and ethane in the United States, by months and districts

(Thousand barrels unless otherwise stated)

Month and district	1962							1963 [1]						
	Production	Yield (percent)	Transfers from gasoline plants	Imports	Exports	Stocks, end of period	Domestic demand	Production [2]	Yield (percent)	Transfers from gasoline plants	Imports	Exports	Stocks, end of period [2]	Domestic demand [2]
By months:														
January	6,535	2.4	22,420	218	310	5,530	29,631	4,628	1.7	22,679	346	362	2,824	28,383
February	6,008	2.5	14,591	205	249	5,272	20,813	4,359	1.7	18,488	343	388	2,172	23,454
March	6,699	2.6	15,844	287	330	4,999	22,773	4,903	1.8	14,015	220	428	2,642	18,240
April	6,292	2.7	12,503	146	247	5,210	18,483	4,758	1.9	11,092	218	358	2,967	15,385
May	6,672	2.6	12,077	64	315	5,925	17,783	5,043	1.9	11,080	101	362	3,707	15,122
June	6,461	2.5	11,716	118	295	6,348	17,577	4,931	1.9	10,581	50	369	4,089	14,811
July	6,688	2.5	12,600	130	314	6,428	19,024	5,041	1.8	12,704	81	396	4,477	17,042
August	6,256	2.4	12,283	117	417	6,251	18,416	4,878	1.8	12,843	93	378	4,677	17,236
September	6,208	2.4	13,680	149	367	6,351	19,570	4,447	1.6	12,100	180	390	4,922	16,092
October	6,047	2.3	14,358	291	342	5,864	20,841	4,176	1.5	13,490	237	379	4,860	17,586
November	6,107	2.4	16,435	266	310	5,483	22,879	4,202	1.6	16,507	252	364	4,568	20,889
December	6,853	2.6	20,226	257	378	4,769	27,672	5,028	1.8	23,313	374	419	3,346	29,518
Total	76,826	2.5	178,733	2,248	3,874	[3] 4,769	255,462	56,394	1.8	178,892	2,495	4,593	3,346	233,758
By districts:														
East Coast	10,212	2.3	(3)	560		393		9,890	2.1	(3)	401		315	
Appalachian No. 1	601	1.6				11		681	1.8				10	
Appalachian No. 2	214	.6				5		430	1.1				2	
Indiana, Illinois, Kentucky, etc.	8,125	1.5				689		10,268	1.8				496	
Minnesota, Wisconsin, North and South Dakota	655	1.4	(3)	952		14		1,059	2.2	(3)	1,097		14	
Oklahoma, Kansas, etc.	6,601	2.4				254		7,520	2.8			3,722	300	(3)
Texas Inland	3,144	2.7			3,006	140	(3)	2,710	2.4				93	
Texas Gulf Coast	21,276	3.1				1,075		7,842	1.0				609	
Louisiana Gulf Coast	13,299	4.9	(3)	--------		786		5,547	2.0	(3)	--------		502	
Arkansas, Louisiana, Inland, etc.	800	1.9				9		960	2.1				6	
New Mexico	274	2.9				2		301	3.0				4	
Rocky Mountain	1,568	1.4	(3)	15		20		1,633	1.5	(3)	10		21	
West Coast	10,057	2.2		721	868	1,371		7,553	1.6		987	871	974	
Total	76,826	2.5	178,733	2,248	3,874	[3] 4,769	255,462	56,394	1.8	178,892	2,495	4,593	3,346	233,758

[1] Preliminary figures.
[2] Production, stocks, and demand for 1963 are not strictly comparable to 1962 due to product reclassification resulting from separately reporting data for petrochemical feedstocks. Stocks on a new basis for comparison with 1963 were 3,916,000 barrels.
[3] Figures not available.

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ASPHALT AND ROAD OIL

The total demand for asphalt in 1963 was 21,455,000 short tons, an increase of 2.7 percent for the year. Shipments of asphalt and asphaltic products for domestic consumption increased 2.5 percent in 1963. Asphalt for paving purposes continued to increase, but the other uses were slightly below the 1962 level.

Road oil production declined 4.1 percent in 1963; however, demand declined only 0.7 percent. Production for the year was 6,792,000 barrels and demand totaled 6,914,000 barrels.

TABLE 71.—Statistical summary of petroleum asphalt and road oil

(Thousand short tons) [1]

	1959	1960	1961	1962	1963 [2]
Petroleum asphalt:					
Production	17,753	17,940	18,513	19,923	20,354
Imports (including natural)	1,250	1,117	1,201	1,204	1,120
Exports	188	168	121	150	130
Stocks (end of period)	1,991	2,362	2,363	2,591	2,610
Apparent domestic consumption	18,598	18,518	19,592	20,749	21,325
Petroleum asphalt shipments:					
Paving	14,581	14,674	15,318	16,322	16,948
Roofing	3,299	3,525	3,635	3,842	3,821
All other	1,895	1,855	1,755	1,932	1,879
Total	19,775	20,054	20,708	22,096	22,648
Road oil:					
Production	1,181	1,085	1,058	1,287	1,235
Stocks (end of period)	119	135	138	159	137
Apparent domestic consumption	1,138	1,069	1,055	1,266	1,257
Road oil shipments	1,143	1,177	1,083	1,109	1,092

[1] Converted from barrels to short tons (5.5 barrels=1 short ton).
[2] Preliminary figures.

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TABLE 72.—Salient statistics of petroleum asphalt in the United States, 1962–63, by months and districts

(Thousand short tons) [1]

Month and district	1962					1963 [2]				
	Production	Imports (including natural)	Exports	Stocks (end of period)	Domestic demand	Production	Imports (including natural)	Exports	Stocks (end of period)	Domestic demand
Month:										
January	869	67	8	2,666	624	902	87	2	2,967	611
February	923	88	10	3,010	657	834	40	14	3,314	513
March	1,264	67	14	3,460	867	1,185	77	8	3,769	799
April	1,544	41	11	3,779	1,255	1,564	84	6	4,336	1,075
May	2,051	115	20	3,872	2,053	2,010	90	8	3,809	2,620
June	2,122	160	16	3,622	2,516	2,200	117	6	3,609	2,511
July	2,306	136	14	3,349	2,702	2,341	123	10	3,057	3,006
August	2,315	97	15	2,625	3,121	2,397	143	13	2,635	2,949
September	2,150	121	9	2,469	2,418	2,247	107	8	2,323	2,658
October	1,890	136	10	2,069	2,416	2,052	111	18	1,885	2,583
November	1,378	98	9	2,110	1,426	1,488	52	10	2,159	1,256
December	1,111	78	14	2,591	694	1,134	88	27	2,610	744
Total	19,923	1,204	150	2,591	20,749	20,354	1,120	130	2,610	21,325
District:										
East Coast	4,690	[3]	94	762	[3]	4,748	[3]	[3]	738	[3]
Appalachian No. 1	273			44		303			76	
Appalachian No. 2	495			59		579			44	
Illinois, Indiana, Kentucky, etc	3,699	[3]	2	390		3,881			410	
Minnesota, Wisconsin, North Dakota	257			32		288			23	
Oklahoma, Kansas, etc	2,037			295		1,993			281	
Texas Inland	904			91		995	[3]	110	103	
Texas Gulf Coast	1,294			81		1,416			99	
Louisiana Gulf Coast	1,112	[3]	26	127		977			145	
Arkansas, Louisiana Inland, etc	979			122		1,014			130	
New Mexico	102			24		109			21	
Rocky Mountain	1,129	[3]		248		1,188			201	
West Coast	2,952	[3]	28	316		2,863	[3]	20	339	
Total	19,923	1,204	150	2,591	20,749	20,354	1,120	130	2,610	21,325

[1] Converted from barrels to short tons (5.5 barrels=1 short ton).
[2] Preliminary.
[3] Not available.

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TABLE 73.—Salient statistics of road oil in the United States, 1962–63, by months and refinery districts

(Short tons) [1]

Month and district	1962			1963 [2]		
	Production	Stocks (end of month)	Domestic demand	Production	Stocks (end of month)	Domestic demand
Month:						
January	22,545	146,727	14,182	38,909	176,182	21,818
February	55,636	193,636	8,727	33,636	186,909	22,909
March	113,273	261,636	45,273	81,454	239,636	28,727
April	74,545	272,363	63,818	123,273	296,364	66,545
May	128,546	283,091	117,818	120,545	308,727	108,182
June	190,182	286,182	187,091	192,909	306,727	194,909
July	195,818	224,545	257,455	231,091	258,909	278,909
August	215,273	182,363	257,455	183,273	212,727	229,455
September	132,182	179,636	134,909	106,182	171,273	147,636
October	71,818	148,182	103,272	79,636	154,727	96,182
November	46,727	148,182	46,727	24,000	141,818	36,909
December	40,545	159,091	29,636	20,001	136,909	24,909
Total	1,287,090	159,091	1,266,363	1,234,909	136,909	1,257,090
District:						
East Coast	6,727		[3]	4,727		[3]
Appalachian No. 1						
Appalachian No. 2	1,273			1,636		
Indiana, Illinois, Kentucky, etc.	339,091	29,091		334,182	8,545	
Minnesota, Wisconsin, North Dakota	28,182			19,636		
Oklahoma, Kansas, etc.	329,091	26,364		312,182	24,000	
Texas Inland						
Texas Gulf Coast	2,727	364		2,727	545	
Louisiana Gulf Coast	727	182		182	182	
Arkansas, Louisiana Inland, etc.	727	182				
New Mexico						
Rocky Mountain	348,909	34,363		346,364	25,455	
West Coast	229,636	68,545		213,273	78,182	
Total	1,287,090	159,091	1,266,363	1,234,909	136,909	1,257,090

[1] Converted from barrels to short tons (5.5 barrels=1 short ton).
[2] Preliminary data.
[3] Not available.

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TABLE 74.—Shipments of petroleum-asphalt paving products for consumption in the United States, by PAD districts and States

(Short tons)

Districts and States	Asphalt cements		Cutback asphalts		Emulsified asphalts		Total	
	1962	1963	1962	1963	1962	1963	1962	1963
District 1:								
Connecticut	111,671	107,284	81,220	44,639	3,109	4,658	196,000	156,581
Delaware	12,895	17,306	13,492	16,589	6,226	2,645	32,613	36,540
Florida	296,261	380,942	93,559	84,997	34,483	48,864	424,303	514,803
Georgia	505,248	438,466	91,464	107,346	40,075	58,306	636,787	604,118
Maine	47,003	64,042	71,076	56,385	14,597	17,460	132,676	137,887
Maryland and District of Columbia	248,838	277,271	76,720	77,297	40,623	58,943	366,181	413,511
Massachusetts	262,871	276,623	50,526	42,024	2,898	1,289	316,295	319,936
New Hampshire	37,089	43,700	39,603	50,570	17	59	76,709	94,329
New Jersey	340,784	346,898	105,154	107,830	25,355	24,782	471,293	479,510
New York	606,948	628,783	309,484	362,865	125,807	133,027	1,042,239	1,124,675
North Carolina	134,921	197,039	209,697	68,837	156,674	135,611	501,292	401,487
Pennsylvania	412,996	405,900	169,626	174,159	62,278	60,411	644,900	640,470
Rhode Island	58,006	43,335	56,891	50,778	258	602	115,155	94,715
South Carolina	128,689	176,400	33,125	29,261	112,379	61,854	274,193	267,515
Vermont	18,869	23,966	24,358	13,793	300	244	43,527	38,003
Virginia	198,751	250,273	94,921	94,597	28,641	46,179	322,313	391,049
West Virginia	81,105	70,420	19,387	18,488	7,720	12,039	108,212	100,947
Total	3,502,945	3,748,648	1,540,303	1,400,455	661,440	666,973	5,704,688	5,816,076
District 2:								
Illinois	254,900	264,812	154,125	158,578	32,783	34,872	441,808	458,262
Indiana	228,633	271,515	137,615	155,484	148,187	176,440	514,435	603,439
Iowa	306,850	232,703	97,035	91,322	37,465	69,155	441,350	393,180
Kansas	247,048	258,553	278,326	230,138	97	38	525,471	488,729
Kentucky	172,493	243,812	84,089	80,233	65,323	67,065	321,905	391,110
Michigan	253,325	227,325	72,428	59,338	61,831	50,791	387,584	337,454
Minnesota	209,885	223,036	205,570	223,417	20,437	24,086	435,892	470,539
Missouri	159,322	190,587	287,361	270,644	6,479	3,741	453,162	464,972
Nebraska	64,321	55,092	54,943	74,254	408	17,148	119,672	146,494
North Dakota	45,711	95,255	55,005	69,868	39,397	39,963	140,113	205,086
Ohio	485,667	465,417	331,515	313,046	150,025	187,258	967,207	965,721
Oklahoma	219,759	220,733	174,226	219,403	1,738	1,982	395,723	442,118
South Dakota	37,243	71,911	38,985	56,818	11,659	10,498	87,887	139,227
Tennessee	301,291	278,874	77,161	60,762	24,022	31,120	402,474	370,756
Wisconsin	162,505	185,452	100,270	103,330	10,088	5,664	272,863	294,446
Total	3,148,953	3,285,077	2,148,654	2,166,635	609,939	719,821	5,907,546	6,171,533

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District 3:									
Alabama	148,002	185,056	70,634	73,139	71,218	77,468	289,854		335,663
Arkansas	68,496	72,230	59,667	52,905	23,502	23,462	151,665		148,687
Louisiana	135,391	151,656	22,152	26,199	36,424	46,034	193,967		223,889
Mississippi	112,587	119,485	29,439	58,530	11,574	31,859	153,600		207,574
New Mexico	96,804	102,273	56,867	59,291	8,357	4,066	104,028		165,650
Texas	655,622	707,910	222,843	220,742	37,432	41,211	915,897		969,863
Total	1,218,902	1,338,610	461,602	488,806	188,507	224,120	1,809,011		2,051,626
District 4:									
Colorado	162,117	171,488	72,732	66,287	128	23	234,977		237,798
Idaho	87,982	40,085	41,356	43,279	8,344	7,674	137,682		91,038
Montana	81,035	92,263	51,827	53,670	6,596	13,773	139,458		159,706
Utah	88,974	78,375	47,564	39,919	155		136,693		118,294
Wyoming	58,105	63,541	38,044	34,808	1,982	2,682	98,131		101,031
Total	478,213	445,752	251,523	237,963	17,205	24,152	746,941		707,867
District 5:									
Alaska	7,539	5,186	4,158	7,391	350	2,181	12,047		14,758
Arizona	85,368	91,892	31,725	22,123	39,278	32,334	156,371		146,349
California	1,129,550	1,121,886	110,756	145,394	115,808	131,426	1,356,114		1,398,706
Hawaii	23,014	21,671	383	718	6,514	3,715	29,911		26,104
Nevada	38,652	87,339	18,497	17,036	6,326	2,197	63,475		106,572
Oregon	179,069	187,950	44,366	41,551	16,407	17,133	239,862		246,634
Washington	136,477	153,672	92,680	96,521	6,923	10,971	236,080		261,164
Total	1,599,669	1,669,596	302,565	330,734	191,606	199,957	2,093,860		2,200,287
Total United States	9,948,702	10,487,683	4,704,647	4,624,683	1,668,697	1,835,023	16,322,046		16,947,389

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TABLE 75.—Shipments of petroleum asphalt roofing products for consumption in the United States, by PAD districts and States

(Short tons)

Districts and States	Asphalt cement and fluxes		Emulsified asphalts		Total	
	1962	1963	1962	1963	1962	1963
District 1:						
Connecticut	12,407	10,541	108	----------	12,515	10,541
Delaware	2,867	4,765	----------	----------	2,867	4,765
Florida	93,302	85,805	63	2	93,365	85,807
Georgia	168,505	189,358	12	114	168,517	189,472
Maine	----------	----------	----------	----------	----------	----------
Maryland and District of Columbia	67,927	67,867	----------	57	67,927	67,924
Massachusetts	71,064	58,829	----------	2	71,064	58,831
New Hampshire	----------	424	----------	----------	----------	424
New Jersey	338,963	337,724	11	----------	338,974	337,724
New York	21,879	31,001	----------	----------	21,879	31,001
North Carolina	44,707	43,071	----------	----------	44,707	43,071
Pennsylvania	168,691	186,370	28	1	168,719	186,371
Rhode Island	39,128	40,006	----------	3	39,128	40,009
South Carolina	52,313	61,079	----------	----------	52,313	61,079
Vermont	2	18	----------	----------	2	18
Virginia	5,167	9,265	----------	15	5,167	9,280
West Virginia	11,597	6,993	----------	----------	11,597	6,993
Total	1,098,519	1,133,116	222	194	1,098,741	1,133,310
District 2:						
Illinois	562,667	509,205	----------	----------	562,667	509,205
Indiana	64,957	124,407	24	1	64,981	124,408
Iowa	8,156	5,695	----------	----------	8,156	5,695
Kansas	37,227	39,019	----------	112	37,227	39,131
Kentucky	2,050	1,418	19	4	2,069	1,422
Michigan	87,130	87,323	15	----------	87,145	87,323
Minnesota	154,752	146,548	----------	----------	154,752	146,548
Missouri	183,709	185,052	----------	----------	183,709	185,052
Nebraska	11,224	10,506	----------	43	11,224	10,549
North Dakota	3,091	3,097	----------	----------	3,091	3,097
Ohio	192,625	205,830	2,545	2,702	195,170	208,532
Oklahoma	51,258	50,614	----------	----------	51,258	50,614
South Dakota	3,078	2,208	----------	----------	3,078	2,208
Tennessee	35,194	24,312	----------	21	35,194	24,333
Wisconsin	7,541	9,675	----------	1	7,541	9,676
Total	1,404,659	1,404,909	2,603	2,884	1,407,262	1,407,793
District 3:						
Alabama	138,196	134,048	78	145	138,274	134,193
Arkansas	60,757	58,030	----------	----------	60,757	58,030
Louisiana	122,840	126,709	----------	2	122,840	126,711
Mississippi	10,439	37,575	----------	2	10,439	37,577
New Mexico	18,485	17,007	----------	----------	18,485	17,007
Texas	313,166	246,720	----------	71	313,166	246,791
Total	663,883	620,089	78	220	663,961	620,309
District 4:						
Colorado	44,306	46,094	----------	----------	44,306	46,094
Idaho	3,916	3,525	----------	----------	3,916	3,525
Montana	4,495	4,879	----------	----------	4,495	4,879
Utah	18,525	17,850	----------	----------	18,525	17,850
Wyoming	2,204	2,034	----------	----------	2,204	2,034
Total	73,446	74,382	----------	----------	73,446	74,382
District 5:						
Alaska	1,453	1,664	----------	----------	1,453	1,664
Arizona	567	221	----------	----------	567	221
California	430,217	432,726	25	87	430,242	432,813
Hawaii	5,511	6,334	----------	14	5,511	6,348
Nevada	558	2,051	----------	----------	558	2,051
Oregon	122,348	101,678	3	31	122,351	101,709
Washington	37,895	40,654	4	27	37,899	40,681
Total	598,549	585,328	32	159	598,581	585,487
Total United States	3,839,056	3,817,824	2,935	3,457	3,841,991	3,821,281

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TABLE 76.—Shipments of all other petroleum asphalt products for consumption in the United States, by PAD districts and States

(Short tons)

Districts and States	Asphalt cements and fluxes		Emulsified asphalts		Total	
	1962	1963	1962	1963	1962	1963
District 1:						
Connecticut	24,376	26,554	593	424	24,969	26,978
Delaware	2,816	3,739	9	8	2,825	3,747
Florida	90,628	70,956	361	568	90,989	71,524
Georgia	65,899	84,323	441	781	66,340	85,104
Maine	3,543	4,064	29	118	3,572	4,182
Maryland and District of Columbia	36,726	36,845	665	1,093	37,391	37,938
Massachusetts	55,477	54,576	1,041	1,374	56,518	55,950
New Hampshire	259	517		23	259	540
New Jersey	237,125	213,287	1,834	2,476	238,959	215,763
New York	29,120	36,410	2,773	2,136	31,893	38,546
North Carolina	60,247	55,862	4,331	5,243	64,578	61,105
Pennsylvania	111,373	112,722	4,926	5,142	116,299	117,864
Rhode Island	8,497	6,754		195	8,497	6,949
South Carolina	6,898	18,363	107	4,731	7,005	23,094
Vermont	1,665	1,235	129	20	1,794	1,255
Virginia	32,308	41,664	740	1,138	33,048	42,802
West Virginia	35,569	28,772	47	62	35,616	28,834
Total	802,526	796,643	18,026	25,532	820,552	822,175
District 2:						
Illinois	174,774	183,351	11,804	13,221	186,578	196,572
Indiana	74,535	80,963	165	441	74,700	81,404
Iowa	6,414	5,015	3,136	2,783	9,550	7,798
Kansas	15,612	14,270	133	68	15,745	14,338
Kentucky	1,331	1,141	1,134	1,665	2,465	2,806
Michigan	39,033	42,991	3,578	4,979	42,611	47,970
Minnesota	22,874	20,021	593	805	23,467	20,826
Missouri	54,863	58,516	2,070	2,484	56,933	61,000
Nebraska	2,526	2,518	111	23	2,637	2,541
North Dakota	1,779	613	2	21	1,781	634
Ohio	90,579	76,946	3,249	3,618	93,828	80,564
Oklahoma	38,182	20,054	2,589	2,030	40,771	22,084
South Dakota	1,013	452	7		1,020	452
Tennessee	6,367	6,809	134	162	6,501	6,971
Wisconsin	33,461	29,923	897	881	34,358	30,804
Total	563,343	543,583	29,602	33,181	592,945	576,764
District 3:						
Alabama	11,365	6,469	547	486	11,912	6,955
Arkansas	7,771	11,798	26	36	7,797	11,834
Louisiana	98,078	80,298	1,346	1,006	99,424	81,304
Mississippi	17,748	14,699	744	817	18,492	15,516
New Mexico	1,910	2,083	24	24	1,934	2,107
Texas	167,737	137,504	1,996	3,621	169,733	141,125
Total	304,609	252,851	4,683	5,990	309,292	258,841
District 4:						
Colorado	4,563	5,515	20	37	4,583	5,552
Idaho	106	64	24	16	130	80
Montana	846	805	6	13	852	818
Utah	2,623	2,813	28	17	2,651	2,830
Wyoming	973	530	5	10	978	540
Total	9,111	9,727	83	93	9,194	9,820
District 5:						
Alaska	767	695		2	767	697
Arizona	2,204	2,206	201	183	2,405	2,389
California	151,428	163,515	11,664	12,788	163,092	176,303
Hawaii	18	34		127	18	161
Nevada	421	500	53	88	474	588
Oregon	13,573	14,873	1,901	1,894	15,474	16,767
Washington	16,172	12,806	1,836	1,840	18,008	14,646
Total	184,583	194,629	15,655	16,922	200,238	211,551
Total United States	1,864,172	1,797,433	68,049	81,718	1,932,221	1,879,151

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TABLE 77.—Shipments of petroleum-asphalts and road oil for consumption in the United States, by PAD districts and States

(Short tons)

Districts and States	Asphalt cements and fluxes	Emulsified asphalts	Cutback asphalts	Total 1963	Total 1962	Percent change	Road oil		Percent change
							1963	1962	
District 1:									
Connecticut	144,379	5,082	44,639	194,100	233,484	−16.9	4		
Delaware	25,810	2,653	16,589	45,052	38,305	17.6	148	80	85.0
Florida	537,703	49,434	84,997	672,134	608,657	10.4	96		
Georgia	712,147	59,201	107,346	878,694	871,644	.8	1		
Maine	68,106	17,578	56,385	142,069	136,248	4.3	116	36	222.2
Maryland and District of Columbia	381,983	60,093	77,297	519,373	471,499	10.2	202	136	48.5
Massachusetts	390,028	2,665	42,024	434,717	443,877	−2.1	121	334	−63.8
New Hampshire	44,641	82	50,570	95,293	76,968	23.8			
New Jersey	897,909	27,258	107,830	1,032,997	1,049,226	−1.6	2,417	855	182.7
New York	696,194	135,163	362,865	1,194,222	1,096,011	9.0	3,513	1,050	234.6
North Carolina	295,972	140,854	68,837	505,663	610,577	−17.2	702		
Pennsylvania	704,992	65,554	174,159	944,705	929,918	1.6	6,349	8,886	−28.6
Rhode Island	90,095	800	50,778	141,673	162,780	−13.0	422	349	20.9
South Carolina	255,842	66,585	29,261	351,688	333,511	5.5			
Vermont	25,219	264	13,793	39,276	45,323	−13.4			
Virginia	301,202	47,332	94,597	443,131	360,528	22.9			
West Virginia	106,185	12,101	18,488	136,774	155,425	−12.0	353	250	41.2
Total 1963	5,678,407	692,699	1,400,455	7,771,561		1.9	14,444		20.6
Total 1962	5,403,990	679,688	1,540,303		7,623,981			11,976	
District 2:									
Illinois	957,368	48,093	158,578	1,164,039	1,191,053	−2.3	201,638	224,617	−10.2
Indiana	476,885	176,882	155,484	809,251	654,116	23.7	25,671	31,827	−19.4
Iowa	243,413	71,938	91,322	406,673	459,056	−11.4	34,052	24,153	41.0
Kansas	311,842	218	230,138	542,198	578,443	−6.3	7,846	7,333	7.0
Kentucky	246,371	68,734	80,233	395,338	326,439	21.1	8,012	11,669	−31.3
Michigan	357,639	55,770	59,338	472,747	517,340	−8.6	26,185	28,414	7.8
Minnesota	389,605	24,891	223,417	637,913	614,111	3.9	28,489	29,592	−3.7
Missouri	434,155	6,225	270,644	711,024	693,804	2.5	80,602	85,790	−6.1
Nebraska	68,116	17,214	74,254	159,584	133,533	19.5	2,592	2,382	8.8
North Dakota	98,965	39,984	69,868	208,817	144,985	44.0	10,709	8,585	24.7
Ohio	748,193	193,578	313,046	1,254,817	1,256,205	−.1	17,523	19,969	−12.3
Oklahoma	291,401	4,012	219,403	514,816	487,752	5.5	5,102	5,395	−5.4
South Dakota	74,571	10,498	56,818	141,887	91,985	54.3	18,384	13,808	33.1
Tennessee	309,995	31,303	60,762	402,060	444,169	−9.5	84	631	−86.7
Wisconsin	225,050	6,546	103,330	334,926	314,762	6.4	132,027	161,719	−18.4
Total 1963	5,233,569	755,886	2,166,635	8,156,090		3.1	598,916		−8.7
Total 1962	5,116,955	642,144	2,148,654		7,907,753			655,884	

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District 3:										
Alabama	325,573	78,099	73,139	476,811	440,040	8.4	10	19	-47.4
Arkansas	142,058	23,498	52,995	218,551	220,219	-.8	118	299	-60.5
Louisiana	358,663	47,042	26,199	431,904	416,231	3.8	1,309	1,962	-33.0
Mississippi	171,759	32,678	56,530	260,967	182,531	43.0			
New Mexico	121,363	4,110	59,291	184,764	184,447	.2	11,079	8,809	25.8
Texas	1,092,134	44,903	220,742	1,357,779	1,398,796	-2.9	76,806	50,082	53.4
Total 1963	2,211,550	230,330	488,896	2,930,776		3.1	89,322	61,161	46.0
Total 1962	2,187,394	193,268	461,602		2,842,264				
District 4:									
Colorado	223,097	60	66,287	289,444	283,866	2.0	22,456	14,049	59.8
Idaho	43,674	7,690	43,279	94,643	141,728	-33.2	21,853	21,155	3.3
Montana	97,947	13,796	53,670	165,403	144,805	14.2	6,785	6,091	11.4
Utah	90,038	17	39,919	129,974	157,869	-12.0	12,825	13,905	-7.8
Wyoming	66,105	2,692	34,808	103,605	101,313	2.3	17,348	17,753	-2.3
Total 1963	529,861	24,245	237,963	792,069		-4.5	81,267	72,953	11.4
Total 1962	560,770	17,288	251,523		829,581				
District 5:									
Alaska	7,545	2,183	7,391	17,119	14,267	20.0			
Arizona	94,319	32,517	22,123	148,959	159,343	-6.5	7,606	6,724	13.1
California	1,718,127	144,301	145,394	2,007,822	1,949,448	3.0	273,873	270,332	1.3
Hawaii	28,039	3,566	718	32,613	35,440	-8.0	58		
Nevada	80,890	2,285	17,036	100,211	64,507	69.3	16,357	18,775	-12.9
Oregon	304,501	19,058	41,551	365,110	377,687	-3.3	7,336	9,691	-24.3
Washington	207,132	12,838	96,621	316,491	291,987	8.4	2,614	1,563	60.8
Total 1963	2,449,553	217,038	330,734	2,997,325		3.6	307,744	307,085	.2
Total 1962	2,382,821	207,283	302,565		2,892,679				
Total United States 1963	16,102,940	1,920,198	4,624,653	22,647,821		2.5	1,091,663	1,109,059	-1.6
Total United States 1962	15,651,930	1,739,681	4,704,647		22,096,258				

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OTHER PRODUCTS

Wax.—The demand for petroleum wax in 1963 was 5,264,000 barrels, a 2.4-percent decline. Domestic demand continued to decline, but exports were slightly higher than in 1962. The average of posted prices on bulk lots of crude scale wax were unchanged from last year, but lower postings were reported for refined and overrefined wax.

Coke.—Although the domestic demand for petroleum coke was less than a year ago, exports increased over 44 percent, and total demand for the year was up 2.4 percent. Production increased from 78.7 million in 1962 to 80.6 million in 1963. About 40 percent of the total production is marketable. The balance was coke burned off catalytic cracking units and was utilized as refinery fuel. Coke with a low sulfur content is used in making electrodes required in the electrolytic production of aluminum.

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TABLE 78.—Salient statistics on wax in the United States, by types, months, and districts

(Thousand barrels)[1]

Month and district	1962										
	Production				Imports (all types)	Exports (all types)	Stocks, end of period				Domestic demand (all types)
	Microcrystalline	Fully refined	Other	Total			Microcrystalline	Fully refined	Other	Total	
By months:											
January	50	234	146	430	----------	80	191	456	396	1,043	368
February	34	233	126	393	----------	88	157	471	352	960	388
March	77	297	116	490	----------	119	169	462	296	927	404
April	64	238	125	427	----------	130	167	450	294	911	313
May	76	271	152	499	----------	123	191	419	309	919	368
June	66	232	125	423	----------	160	153	424	286	863	319
July	69	235	186	490	----------	119	181	410	395	986	248
August	67	249	153	469	----------	144	198	416	373	987	324
September	69	261	97	427	----------	126	202	435	349	986	302
October	51	248	159	458	----------	102	194	406	378	978	364
November	57	243	112	412	----------	124	201	397	353	951	315
December	62	241	132	435	----------	114	223	428	369	1,020	252
Total	742	2,982	1,629	5,353	----------	1,429	223	428	369	1,020	3,965
By districts:											
East Coast	209	1,361	316	1,886	----------		31	79	35	145	
Appalachian No. 1	14	47	222	283	----------		16	52	25	93	
Appalachian No. 2	----------	50	29	79	----------		----------	7	----------	7	
Indiana, Illinois, Kentucky, etc	14	232	119	365	----------		2	25	73	100	
Minnesota, Wisconsin, etc	----------	----------	----------	----------	----------		----------	----------	----------	----------	
Oklahoma, Kansas, etc	285	219	97	601	----------		78	80	6	164	
Texas Inland	70	----------	----------	70	----------	1,246	21	----------	----------	21	(3)
Texas Gulf	87	552	391	1,030	----------		34	52	123	209	
Louisiana Gulf Coast	32	20	453	505	----------		11	5	83	99	
Arkansas, Louisiana Inland, etc	----------	----------	----------	----------	----------		----------	----------	----------	----------	
New Mexico	----------	----------	----------	----------	----------		----------	----------	----------	----------	
Rocky Mountain	31	52	2	85	----------		30	9	24	63	
West Coast	----------	449	----------	449	----------	183	----------	119	----------	119	
Total	742	2,982	1,629	5,353	----------	1,429	223	428	369	1,020	3,965

See footnotes at end of table.

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TABLE 78.—Salient statistics on wax in the United States, by types, months, and districts—Continued

(Thousand barrels)[1]

Month and district	1963[2]									
	Production				Imports (all types)	Exports (all types)	Stocks, end of period				Domestic demand (all types)
	Microcrystalline	Fully refined	Other	Total			Microcrystalline	Fully refined	Other	Total	
By months:											
January	83	164	132	379		37	243	397	392	1,032	330
February	45	199	142	386		121	236	375	393	1,004	293
March	50	241	129	420		142	214	340	364	918	364
April	51	263	123	437		150	195	346	340	881	324
May	77	242	121	440		146	195	332	332	859	316
June	70	237	166	473		124	194	364	353	911	297
July	65	222	117	404	3	118	182	364	339	885	315
August	87	227	147	461		130	188	361	359	908	308
September	57	217	173	447		132	177	363	363	903	320
October	83	245	115	443	1	132	184	353	340	877	338
November	58	208	118	384		118	166	372	322	860	283
December	93	206	153	452		104	191	390	305	886	322
Total	819	2,671	1,636	5,126	4	1,454	191	390	305	886	3,810
By districts:											
East Coast	211	1,101	350	1,662	4		31	85	46	162	
Appalachian No. 1	109	47	227	383			12	26	29	67	
Appalachian No. 2		61	20	81				8		8	
Indiana, Illinois, Kentucky, etc	15	197	132	344			2	22	69	93	
Minnesota, Wisconsin, etc											
Oklahoma, Kansas, etc	269	160	87	516		1,323	57	45	3	105	(3)
Texas Inland	85			85			36			36	
Texas Gulf	82	657	293	1,032			30	91	69	190	
Louisiana Gulf Coast	19	10	442	471			5	2	51	58	
Arkansas, Louisiana Inland, etc											
New Mexico											
Rocky Mountain	29	29	24	82			18	8	38	64	
West Coast		409	61	470		131		103		103	
Total	819	2,671	1,636	5,126	4	1,454	191	390	305	886	3,810

[1] Conversion factor: 280 pounds to the barrel.
[2] Preliminary figures.
[3] Figures not available.

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TABLE 79.—Average monthly refinery prices of 124°–126° white crude scale wax at Pennsylvania refineries

(Cents per pound)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average for year
1959	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25
1960	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.23	6.13	6.24
1961	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13
1962	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13
1963	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13	6.13

Source: Platt's Oil Price Handbook.

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TABLE 80.—Salient statistics of petroleum coke in the United States, by months and districts[1]

(Thousand barrels unless otherwise stated)

Month and district	1962							1963[2]						
	Production			Yield (percent)	Exports	Stocks, end of period	Domestic demand	Production			Yield (percent)	Exports	Stocks, end of period	Domestic demand
	Marketable	Catalyst	Total					Marketable	Catalyst	Total				
By months:														
January	2,800	3,797	6,597	2.5	453	5,312	6,148	2,431	4,143	6,574	2.4	234	5,954	6,266
February	2,388	3,704	6,092	2.5	855	5,265	5,284	2,360	3,822	6,182	2.5	833	6,020	5,283
March	2,676	4,016	6,692	2.6	479	5,356	6,122	2,672	4,011	6,683	2.5	704	6,003	5,996
April	2,250	3,602	5,852	2.4	535	5,153	5,520	2,744	3,734	6,478	2.6	984	5,905	5,592
May	2,714	3,973	6,687	2.6	703	5,072	6,065	2,505	4,000	6,505	2.5	965	5,692	5,753
June	2,838	4,121	6,959	2.7	865	5,059	6,107	2,734	3,864	6,598	2.5	896	5,643	5,751
July	2,537	4,157	6,694	2.5	767	5,240	5,746	2,893	4,144	7,037	2.6	918	5,786	5,976
August	2,727	4,120	6,847	2.6	567	5,052	6,468	2,749	4,176	6,925	2.4	1,294	5,762	5,655
September	2,606	3,905	6,511	2.5	689	5,219	5,655	2,724	4,024	6,748	2.5	1,087	5,857	5,566
October	2,791	3,826	6,617	2.5	441	5,186	6,209	2,750	4,085	6,835	2.6	991	5,973	5,728
November	2,552	3,783	6,335	2.5	554	5,398	5,569	2,886	3,890	6,776	2.6	698	6,906	5,145
December	2,745	4,096	6,841	2.6	548	5,880	5,811	2,980	4,307	7,287	2.7	1,157	6,483	6,553
Total	31,624	47,100	78,724	2.6	7,456	5,880	70,704	32,428	48,200	80,628	2.6	10,761	6,483	69,264
By districts:														
East Coast	5,506	7,340	12,846	2.9		1,639		5,755	7,653	13,408	2.9		1,089	
Appalachian No. 1	-------	130	130	.3		-------		-------	148	148	.4		-------	
Appalachian No. 2	15	427	442	1.3		-------		51	517	568	1.5		-------	
Indiana, Illinois, Kentucky, etc	7,340	8,754	16,094	3.0		843		6,753	9,685	16,438	2.9		1,013	
Minnesota, Wisconsin, etc	1,076	675	1,751	3.7		36		1,297	704	2,001	4.1		251	
Oklahoma, Kansas, etc	3,765	4,712	8,477	3.1		266		3,574	4,186	7,760	2.9		803	
Texas Inland	411	1,487	1,898	1.7	4,721	-------	(3)	456	1,559	2,015	1.7	6,624	-------	(3)
Texas Gulf Coast	3,597	12,725	16,322	2.3		57		3,955	13,102	17,057	2.3		18	
Louisiana Gulf Coast	353	5,039	5,392	1.9		27		1,317	4,565	6,382	2.2		10	
Arkansas, Louisiana Inland, etc	1,330	784	2,114	4.9		523		1,317	770	2,087	4.7		677	
New Mexico	-------	51	51	.6		-------		-------	47	47	.5		-------	
Rocky Mountain	609	2,095	2,704	2.4		1,241		454	2,094	2,548	2.3		1,308	
West Coast	7,622	2,881	10,503	2.2	2,735	1,248		6,999	3,170	10,169	2.2	4,137	1,314	
Total	31,624	47,100	78,724	2.6	7,456	5,880	70,704	32,428	48,200	80,628	2.6	10,761	6,483	69,264

[1] Conversion factor: 5.0 barrels to the short ton.
[2] Preliminary figures.
[3] Figures not available.

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Still gas.—The production of still gas in 1963 was 796,634 million cubic feet (129,518,000 barrels). This does not include 7,834,000 barrels used for petrochemical feedstocks. Refiners used 788,605 million cubic feet as refinery fuel. The heating value of the gas in 1963 was 976 Btu per cubic foot compared with 1,003 Btu in 1962.

TABLE 81.—Production of still gas in the United States by districts

District	1961		1962		1963 [1]	
	Million cubic feet	Equivalent in thousand barrels	Million cubic feet	Equivalent in thousand barrels	Million cubic feet	Equivalent in thousand barrels
East Coast	91,911	15,908	92,733	15,922	100,825	17,048
Appalachian No. 1	9,269	1,665	11,524	1,837	9,659	1,838
Appalachian No. 2	12,658	1,909	12,450	1,829	12,844	1,833
Indiana, Illinois, Kentucky, etc	162,774	26,984	157,965	26,308	155,505	24,911
Minnesota, Wisconsin, North Dakota, and South Dakota	9,156	1,513	9,272	1,554	8,454	1,303
Oklahoma, Kansas, etc	63,787	10,632	67,163	10,831	69,463	11,255
Texas Inland	31,093	5,194	25,354	4,733	31,712	5,821
Texas Gulf Coast	165,358	23,681	176,709	26,118	186,844	26,120
Louisiana Gulf Coast	54,777	7,675	60,720	9,131	54,200	8,159
Arkansas, Louisiana Inland, etc	11,119	2,062	11,296	2,080	11,628	2,001
New Mexico	1,260	242	1,525	284	1,483	283
Rocky Mountain	20,774	4,039	20,609	4,047	20,193	3,658
West Coast	139,479	26,033	135,456	26,155	133,824	25,288
Total	773,415	127,537	782,776	130,829	796,634	129,518

[1] Preliminary figures.

Petrochemical Feedstocks.—With increasing volumes of refinery-produced petroleum products being used as feedstocks by the petrochemical industry, it became difficult to evaluate use patterns of the various products. For this reason, petroleum refiners were asked to report data for feedstocks separately in 1963. These feedstocks are now being reported in for boiling-range categories (still gas, liquefied refinery gas, naphtha-400°, and other. This provides a measure of the volume of refinery output used in the manufacture of petrochemicals and eliminates chemical manufacture from the regular petroleum refining operations

The demand for petrochemical feedstocks in 1963 was 91,756,000 barrels, of which 8.5 percent represented still gas; 42.8 percent, LRG; 24.0 percent, naphtha-400°; and 24.7 percent, other. The average yield of petrochemical feedstocks per barrel of crude oil processed in 1963 was 2.8 percent.

Miscellaneous Oils.—The total demand for miscellaneous finished products in 1963 was 16,600,000 barrels. Production for the year was 16,400,000 barrels, of which 82.8 percent was produced at petroleum refineries and 17.2 percent at natural-gas processing plants. Beginning in 1963 the refining companies were requested to exclude petrochemical production and petrochemical feedstocks from the data for miscellaneous oils.

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TABLE 82.—Production of miscellaneous finished oils in the United States in 1963 by districts and classes

(Thousand barrels)

District	Absorption	Petrolatum	Specialty oils			All other products	Total
			Medicinal	Spray oils	Other		
East Coast			89	11	1,084	679	1,863
Appalachian No. 1		114	12		35	70	231
Appalachian No. 2				31		19	50
Indiana, Illinois, Kentucky, etc.		57		211	166	800	1,234
Minnesota, Wisconsin, North Dakota, and South Dakota						73	73
Oklahoma, Kansas, etc.	104	428		6	158	1,053	1,749
Texas Inland	362				61	2,075	2,498
Texas Gulf	47	420		26	57	2,832	3,382
Louisiana Gulf	1,231	11			5	105	1,352
Arkansas, Louisiana Inland	1,042					24	1,066
Rocky Mountain, New Mexico	107				12	268	387
West Coast	26	28	67	69	655	1,670	2,515
Total	2,919	1,058	168	354	2,233	9,668	16,400

Unfinished Oils.—Unfinished oils include all oils that will be cracked or further distilled. The rerun (net) of unfinished oils represents the imports plus or minus the change in stocks.

Imports of unfinished oils are included with crude oil under the quota established by the Oil Imports Administration. By regulation, unfinished imports are restricted to 10 percent of the crude oil and unfinished oils quota.

INTERCOASTAL SHIPMENTS

A total of 758,438,000 barrels of crude petroleum and petroleum products was shipped in intercoastal trade in 1963. This is an increase of 5.2 percent over 1962, and is due, in part, to better reporting of military shipments of gasoline and jet fuel.

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TABLE 83.—Petroleum oils, crude and refined, shipped from gulf and west coasts to east coast ports and from the gulf coast to west coast ports, 1963 by months and year 1962

(Thousand barrels)

Item	1963													1962 total
	January	February	March	April	May	June	July	August	Septem ber	October	Novem- ber	Decem ber	Total	
Gulf coast to east coast: [1]														
Crude oil	9,402	16,233	15,693	15,383	13,016	13,894	15,865	14,353	12,007	12,298	11,929	11,370	161,443	159,519
Gasoline	18,660	19,576	19,683	22,720	23,457	19,684	21,932	20,489	17,928	19,246	22,017	19,565	244,957	241,303
Kerosine	5,588	4,976	4,608	3,891	3,807	3,214	4,045	4,270	3,087	3,967	5,107	5,337	51,897	48,850
Distillate fuel oil	26,897	21,916	20,870	14,783	16,000	12,051	14,359	15,709	13,993	16,154	18,021	24,197	214,950	195,815
Residual fuel oil	2,345	3,661	3,313	3,069	2,088	2,174	2,480	2,244	2,544	2,718	2,439	2,563	31,638	39,344
Military jet fuel	1,193	939	1,014	1,504	1,208	1,387	1,208	1,250	1,694	845	1,638	918	14,807	(2)
Lubricating oil	782	575	714	763	641	660	575	942	590	811	659	1,056	8,768	8,609
Other products	748	810	856	789	955	1,347	813	1,280	1,835	1,168	1,645	1,041	13,287	12,783
Total	65,615	68,686	66,751	62,902	61,172	54,411	61,277	60,546	53,678	57,207	63,455	66,047	741,747	706,223
West coast to east coast:														
Gasoline			151	168		146							465	
Distillate fuel oil	532	147		148	208		121	201	293	139	167	129	2,085	3,543
Residual fuel oil	699	206	206	1	202	387	1,131	1,165	853	802	260	447	6,359	4,613
Lubricating oil	46	8	44		64	53		102	47	23	10	99	496	525
Other products	95		20	5	10	12		4	45		9	7	207	870
Total	1,372	361	421	322	484	598	1,252	1,472	1,238	964	446	682	9,612	9,551
Gulf coast to west coast: [1]														
Crude oil														541
Gasoline	71	339	381	5		500	155	244	306	96	5		2,102	2,611
Kerosine														136
Distillate fuel oil					15				5				20	
Military jet fuel	382	186	83	355	176	355	852	583	653	148	124		3,897	285
Unfinished oils														39
Lubricating oil	76	221	8	98	224	59	28	121	40	12	67	25	979	1,337
Other products	5	4	3	12		4			7		34	12	81	30
Total	534	750	475	470	415	918	1,035	948	1,011	256	230	37	7,079	4,979

[1] Source: Geological Survey, U.S. Department of the Interior (OCR-1 Reports).
[2] Not available.

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FOREIGN TRADE

Foreign trade statistics reported in this section were compiled from two sources. The imports of crude oil and unfinished oils were obtained from the petroleum refining companies. Imports of the refined petroleum products and all export data were compiled from records of the U.S. Department of Commerce.

Imports.—Total imports of all oils increased 17,789,000 barrels in 1963 to 777,582,000 barrels. Imports of residual fuel oil accounted for 56 percent of the increase, and military jet fuel, 30 percent. The additional imports of residual fuel oil were needed to meet demand requirements of east coast consumers, because of the decline in the supply available from domestic sources. Almost 99 percent of the kerosine imported in 1963 was used as fuel for commercial jetplanes engaged in oversea flights.

Exports.—Reversing the downward trend which has occurred for the past several years, exports of petroleum increased from 61,431,000 barrels in 1962 to 75,936,000 barrels in 1963. The increase was due primarily to large shipments of fuel oils to Europe during the first part of the year to relieve fuel shortage caused by exceptionally cold weather.

The slight differences between the total exports shown on tables 86 and 87 result from more recent revisions incorporated in table 87.

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TABLE 84.—Petroleum oils crude and refined, imported into the United States, by months [1]

(Thousand barrels)

Year and class	January	February	March	April	May	June	July	August	September	October	November	December	Total
1962:													
Crude petroleum	36,349	31,603	31,761	32,249	34,181	33,817	35,936	40,293	34,407	35,828	33,266	31,349	411,039
Gasoline	444	873	829	992	1,029	1,438	987	1,355	1,561	1,401	1,284	1,685	13,878
Kerosine	566	207	284	455	578	565	730	606	669	754	487	516	6,417
Distillate fuel oil	2,420	727	685	1,514	1,457	986	889	453	1,015	690	533	462	11,831
Residual fuel oil	31,833	23,484	26,763	20,404	18,387	16,781	17,420	16,117	18,253	19,482	25,450	29,940	264,314
Military jet fuel	1,702	147	1,164	479	526	1,274	171	1,004	2,535	475	513	907	10,897
Lubricants	1	1	1	2	1	1	1	1	4	9	4	2	28
Wax													
Asphalt	363	483	367	228	633	882	748	531	672	748	540	430	6,625
Liquefied gases (including ethane)	218	205	287	146	64	118	130	117	149	291	266	257	2,248
Unfinished oils	2,739	2,497	2,732	2,675	2,639	2,697	2,379	4,134	2,717	3,052	1,443	2,812	32,516
Total refined	40,286	28,624	33,112	26,895	25,314	24,742	23,455	24,318	27,575	26,902	30,520	37,011	348,754
Total crude and refined	76,635	60,227	64,873	59,144	59,495	58,559	59,391	64,611	61,982	62,730	63,786	68,360	759,793
1963: [2]													
Crude petroleum	41,043	30,898	36,070	32,593	34,484	31,872	38,214	36,666	34,898	31,362	34,241	30,319	412,660
Refined products:													
Gasoline	1,589	750	1,487	1,923	1,060	1,488	1,068	1,242	1,848	1,569	932	1,189	16,145
Kerosine	625	393	566	722	588	861	979	848	896	776	682	706	8,642
Distillate fuel oil	1,115	809	623	606	606	711	714	631	678	867	956	833	9,149
Residual fuel oil	34,484	30,332	23,977	24,780	19,073	15,330	18,132	16,909	15,748	23,191	20,749	31,609	274,314
Military jet fuel	2,214	536	133	863	2,637	283	1,804	2,329	1,331	2,403	1,078	679	16,290
Lubricants		2	3		2	2	2	4	3	2	1	2	23
Wax							3			1			4
Asphalt	478	221	421	465	496	642	675	788	588	608	290	486	6,158
Liquefied gases (including ethane)	346	343	220	218	101	50	81	93	180	237	252	374	2,495
Unfinished oils	2,200	2,158	2,379	2,914	2,489	2,886	3,571	2,685	2,622	3,006	2,668	2,124	31,702
Total refined	43,051	35,544	29,809	32,491	27,052	22,253	27,029	25,529	23,894	32,660	27,608	38,002	364,922
Total crude and refined	84,094	66,442	65,879	65,084	61,536	54,125	65,243	62,195	58,792	64,022	61,849	68,321	777,582

[1] Imports of crude and unfinished oils reported to the Bureau of Mines; imports of refined products compiled from records of the U.S. Department of Commerce.
[2] Preliminary figures.

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TABLE 85.—Crude oil and petroleum products imported into the United States, 1962–63, by country and receiving district

(Thousand barrels)

Country	Crude oil [1]	Gasoline	Kerosine [2 3]	Distillate fuel oil [3]	Residual fuel oil [3]	Military jet fuel	Liquefied gases	Asphalt	Unfinished oils [1]	Lubricants	Wax	Total
1962:												
North America:												
Canada	85,152	541		395	1,726	12	2,002	10	1,452	10		91,300
Mexico	3,644				7,441				6,731			17,816
Netherlands Antilles		1,582	2,510	3,558	89,870	5,702		3,312	1,967			108,501
Trinidad and Tobago		382	595	172	25,656	1,418		33	1,574			29,830
Other [4]		8,751	1	2,457	5,751							16,960
Total	88,796	11,256	3,106	6,582	130,444	7,132	2,002	3,355	11,724	10		264,407
South America:												
Argentina					149							149
Brazil	1,277				404							1,681
Colombia	8,614			15	298							8,927
Venezuela	168,993	2,575	3,267	4,741	130,641	3,709	246	3,177	13,340			330,689
Other					25							25
Total	178,884	2,575	3,267	4,756	131,517	3,709	246	3,177	13,340			341,471
Europe:												
Italy		12			110	14						136
United Kingdom			39	273					405	7		724
Other			5	220	113	35		93	626	11		1,103
Total		12	44	493	223	49		93	1,031	18		1,963
Asia:												
Indonesia	24,480								870			25,350
Iran	17,735								28			17,763
Iraq	856											856
Japan									1,302			1,302
Kuwait	40,749				82				2,901			43,732
Qatar	9,535								329			9,864
Saudi Arabia	24,359	35			1,913				577			26,884
Other	15,837				128	7			414			16,386
Total	133,551	35			2,123	7			6,421			142,137

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Africa:												
Libya	6,722											6,722
United Arab Republic (Egypt)	1,543											1,543
Other	1,543				7							1,550
Total	9,808				7							9,815
Total imports [4]	411,039	13,878	6,417	11,831	264,314	10,897	2,248	6,625	32,516	28		759,793
Imports by PAD districts:												
District 1	244,235	12,642	4,165	9,811	237,565	9,527	560	5,189	22,297	16		546,007
District 2	34,646	129		31	610	12	952	10	360	2		36,752
District 3	2,489			1,892	11,775			1,426	1,616	8		19,206
District 4	682			92	47		15					836
District 5	128,987	1,107	2,252	5	14,317	1,358	721		8,243	2		156,992
1963: [5]												
North America:												
Canada	90,394	576	4	180	1,727		2,259	77	1,504	15	1	96,737
Mexico	3,657			7	6,781				6,926			17,371
Netherlands Antilles		3,716	3,633	3,308	89,627	7,095		2,915	3,733			114,027
Trinidad and Tobago		386	1,594	83	33,355	3,459		28	2,121			41,026
Other [4]		8,778	19	2,276	8,366							19,439
Total	94,051	13,456	5,250	5,854	139,856	10,554	2,259	3,020	14,284	15	1	288,600
South America:												
Argentina					2,310							2,310
Brazil	2,052				108							2,160
Colombia	8,293				605							8,898
Venezuela	174,537	2,580	3,258	3,208	128,095	5,717	195	3,093	9,193			329,876
Other					1							1
Total	184,882	2,580	3,258	3,208	131,119	5,717	195	3,093	9,193			343,245
Europe:												
Italy			76						232			308
United Kingdom		10			206		29		896	1		1,142
Other			58	4	193	19	1	45	346	7	3	676
Total		10	134	4	399	19	30	45	1,474	8	3	2,126

See footnotes at end of table.

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TABLE 85.—Crude oil and petroleum products imported into the United States, 1962–63, by country and receiving district—Continued

(Thousand barrels)

Country	Crude oil [1]	Gasoline	Kerosine [2 3]	Distillate fuel oil [3]	Residual fuel oil [3]	Military jet fuel	Liquefied gases	Asphalt	Unfinished oils [1]	Lubricants	Wax	Total
1963 [r]—Continued												
Asia:												
Indonesia	21,340								1,636			22,976
Iran	22,717								80			22,797
Iraq	321											321
Japan									508			508
Kuwait	29,680								2,953			32,633
Qatar	5,835								289			6,124
Saudi Arabia	28,806			83	2,003		11		786			31,689
Other	15,855	99			937				499			17,390
Total	124,554	99		83	2,940		11		6,751			134,438
Africa:												
Libya	7,021											7,021
United Arab Republic (Egypt)	1,772											1,772
Other	380											380
Total	9,173											9,173
Total imports [4]	412,660	16,145	8,642	9,149	274,314	16,290	2,495	6,158	31,702	23	4	777,582
Imports by PAD districts:												
District 1	248,199	14,537	5,787	7,826	254,346	13,667	401	4,854	21,779	14	4	571,414
District 2	34,666	151		63	800		1,097	76	476	6		37,335
District 3	1,698	125	20	1,250	12,327			1,228	2,102	2		18,752
District 4	3,528	1		1	26		10			1		3,567
District 5	124,569	1,331	2,835	9	6,815	2,623	987		7,345			146,514

[1] Imports of crude oil and unfinished oils reported to the Bureau of Mines, imports of refined products compiled from records of the U.S. Department of Commerce.
[2] Includes commercial jet fuel.
[3] Includes quantities imported duty free for supply of vessels and aircraft engaged in foreign trade.
[4] Includes receipts from Puerto Rico.
[r] Preliminary.

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TABLE 86.—Petroleum oils, crude and refined, exported from the United States, including shipments to territories and possessions, by months [1]

(Thousand barrels)

Year and class	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1962:													
Crude petroleum	99	141	208	87	340	42	190	184	91	3	260	145	1,790
Refined products:													
Gasoline [2]	393	400	284	821	418	537	614	757	703	839	397	429	6,592
Kerosene	16	10	16	21	20	15	37	67	28	40	26	41	337
Distillate fuel oil	834	720	872	466	454	347	409	553	869	533	988	1,179	8,224
Residual fuel oil	1,213	1,604	1,388	1,011	1,454	820	1,010	1,050	837	618	939	906	12,850
Military jet fuel			1	1	1	1			34	10	10	24	82
Lubricants	1,336	942	1,160	1,805	1,656	1,539	1,623	1,533	1,858	1,011	1,403	1,827	17,693
Wax	80	88	119	130	123	160	119	144	126	102	124	114	1,429
Coke	453	855	479	535	703	865	767	567	689	441	554	548	7,456
Asphalt	44	57	78	61	110	90	74	80	50	53	51	78	826
Liquefied gases (including ethane)	310	249	330	247	315	295	314	417	367	342	310	378	3,874
Miscellaneous	14	18	23	21	14	23	20	27	18	14	20	25	237
Total refined	4,693	4,943	4,750	5,119	5,268	4,692	4,987	5,195	5,579	4,003	4,822	5,549	59,600
Total crude and refined	4,792	5,084	4,958	5,206	5,608	4,734	5,177	5,379	5,670	4,006	5,082	5,694	61,390
1963: [3]													
Crude petroleum	185	122	95	170	153	123	152	186	100	179	106	166	1,737
Refined products:													
Gasoline [2]	316	699	537	560	237	685	453	474	667	783	652	876	6,939
Kerosene	106	172	50	23	43	8	51	30	12	19	24	20	558
Distillate fuel oil	1,092	2,989	1,145	1,219	1,170	1,012	972	1,124	1,390	1,125	1,296	438	14,972
Residual fuel oil	814	1,477	1,060	1,315	1,338	967	1,123	1,358	1,719	959	1,829	1,322	15,281
Military jet fuel	13	20	9	32	10	10	9	12	11	13	39	15	193
Lubricants	1,129	1,349	1,388	1,861	1,818	1,307	1,772	1,464	1,567	1,499	1,390	1,797	18,341
Wax	37	121	142	150	146	124	118	130	132	132	118	104	1,454
Coke	234	833	704	984	965	896	918	1,294	1,087	991	698	1,157	10,761
Asphalt	7	76	43	35	42	32	57	70	47	100	57	151	717
Liquefied gases (including ethane)	362	388	428	358	362	369	396	378	390	379	364	419	4,593
Miscellaneous	3	27	30	26	23	16	20	19	18	22	18	17	239
Total refined	4,113	8,151	5,536	6,563	6,154	5,426	5,889	6,353	7,040	6,022	6,485	6,316	74,048
Total crude and refined	4,298	8,273	5,631	6,733	6,307	5,549	6,041	6,539	7,140	6,201	6,591	6,482	75,785

[1] Compiled from records of U.S. Department of Commerce.

[2] Includes benzol, naphtha, natural gasoline, and antiknock compounds.

[3] Preliminary figures.

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TABLE 87.—Crude petroleum and petroleum products exported from the United States by countries of destination and shipments to and exports from territories and possessions

(Thousand barrels)

Country	Crude petroleum	Gasoline [1]	Kerosine	Distillate oil	Residual oil	Lubricating oil	Asphalt	Liquefied petroleum gases	Wax	Coke	Petrolatum	Miscellaneous products	Total
1962:													
North America:													
Canada	8	947	47	574	2,788	1,357	81	87	135	1,620	14	56	7,714
El Salvador		6				25	1	(2)	9		(2)	(2)	41
Mexico	(2)	207	20	77	559	155	194	3,546	152	6	10	55	4,981
Netherlands Antilles		2,059			1	16	9	(2)	(2)		1	2	2,088
Other		66	6	102	15	362	40	63	82	(2)	8	15	759
Total	8	3,285	73	753	3,363	1,915	325	3,696	378	1,626	33	128	15,583
South America:													
Argentina		(2)			111	84	3	84	1		(2)	1	284
Brazil		58	8	(2)		1,448	1	(2)	89	35	9	1	1,649
Chile		(2)	2	10		147	88	2	49		1	9	308
Colombia		12	(2)		11	233	2	1	105		3	10	377
Peru		4				159			25		1	9	198
Venezuela		192	(2)		(2)	109	8	2	35		4	1	351
Other		3	(2)		31	151	12	1	42	(2)	1	9	250
Total		269	10	10	153	2,331	114	90	346	35	19	40	3,417
Europe:													
Belgium-Luxembourg		5	1		(2)	952	2	(2)	15	191	4	12	1,182
Denmark		(2)		103		198	(2)	1	13	(2)	(2)	3	318
France		170	1	3	384	61	3	3	53	285	4	2	969
Germany, West		80	15	126	(2)	472	(2)	32	147	606	10	4	1,492
Greece		109			(2)	106	1		2		(2)	2	220
Italy		219	1		377	632	7	12	53	677	7	9	1,994
Netherlands		70	2	419	278	385	5	3	54	442	3	10	1,671
Norway		1			1	[3] 33	1		2	576	1	4	[3] 619
Sweden		4		507		366	1	(2)	9	41	1	13	942
United Kingdom	428	542	28	104	502	1,249	2	8	84	77	19	1	3,044
Other		31	2	(2)	2	521	10	2	50	247	9	9	883
Total	428	1,231	50	1,262	1,544	[3] 4,975	32	61	482	3,142	58	69	[3] 13,334

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Asia:												1,604
India		40	1	11		1,392	6		2	134	11	7	361
Indonesia		1		(2)		288	37		6		27	2	[3] 19,687
Japan-Nansei and Nanpo Islands	[3] 1,354	174	5	6,408	7,500	1,790	17	9	42	2,339	26	23	367
Malaya, Federation of, and Singapore		151		(2)		203	(2)		(2)		2	11	[3] 431
Philippines		7	(2)	(2)		[3] 375	5		14		10	20	574
Turkey		115	2			425	1		(2)		(2)	31	1,570
Other	(2)	60	(2)			1,332	26	(2)	59	35	11	47	
Total	[3] 1,354	548	8	6,419	7,500	[3] 5,805	92	9	123	2,508	87	141	[3] 24,594
Africa:													1,007
Congo, Republic of the, and Ruanda-Urundi		383	128	308		123	21		(2)	(2)	1	43	846
South Africa, Republic of		157	(-)	(2)	1	531	89	(2)	34		17	17	235
United Arab Republic (Egypt)		4	(2)			226			(2)		(2)	5	22
Western Africa, n.e.c.		4	(2)			16	1				(2)	1	545
Other		6	8			392	37	8	24	32	10	28	
Total		554	136	308	1	1,288	148	8	58	32	28	94	2,655
Oceania:													1,216
Australia		26	8	10	260	747	5	1	32	113	10	4	276
French Pacific Islands		66	23	151	28	3	(2)	5	(2)			(2)	134
New Zealand		8	3			105	1	3	11		3	(2)	11
Other			1	5	3	(2)		2				(2)	
Total		100	35	166	291	855	6	11	43	113	13	4	1,637
Grand total	[3] 1,790	5,987	312	8,918	12,852	[3] 17,169	717	3,875	1,430	7,456	238	476	[3] 61,220
Shipments from the United States to territories and possessions:													
Puerto Rico		5	(2)		(4)	115	88	(4)	(4)	(4)	(4)	6	214
Virgin Islands		44	21	48	(4)	4	13	(4)	(4)	(4)	(4)	(2)	130
Wake		505	(2)	22	(4)	(2)	1	(4)	(4)	(4)	(4)	(2)	528
Other		97	4	65	(4)	4	8	(4)	(4)	(4)	(4)	(2)	178
Total		651	25	135	(4)	123	110	(4)	(4)	(4)	(4)	6	1,050
Exports from territories to foreign countries: Puerto Rico		(2)		829	3	(2)	4	3					839
Total net shipments from the United States	[4] 1,790	6,638	337	8,224	12,849	[3] 17,292	823	3,872	1,430	7,456	238	482	[3] 61,431

See footnotes at end of table.

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TABLE 87.—Crude petroleum and petroleum products exported from the United States by countries of destination and shipments to and exports from territories and possessions—Continued

(Thousand barrels)

Country	Crude petroleum	Gasoline [1]	Kerosine	Distillate oil	Residual oil	Lubricating oil	Asphalt	Liquefied petroleum gases	Wax	Coke	Petrolatum	Miscellaneous products	Total
1963:													
North America:													
Canada	2	897	83	540	3,357	1,327	127	151	139	1,300	18	46	7,987
El Salvador		9				29	11	(2)	10		1	2	62
Mexico	3	312	(2)	215	1,554	99	63	4,232	183	61	16	154	6,892
Netherlands Antilles		2,526				16	(2)	(2)			(2)	(2)	2,542
Other		113	3	121	29	405	30	70	82		6	18	877
Total	5	3,857	86	876	4,940	1,876	231	4,453	414	1,361	41	220	18,360
South America:													
Argentina		1				198	3	(2)	1		(2)	(2)	203
Brazil		9	17	4		1,200	(2)	4	42	49	9	1	1,335
Chile		1	1			185	49		44		1	7	288
Colombia		16	(2)		(2)	192	(2)	(2)	100	(2)	5	6	319
Peru		1		1	205	144	(2)	(2)	28		2	9	390
Venezuela		196	1			47	6	(2)	42	(2)	3	1	296
Other		4	(2)	(2)	14	127	4	2	44		2	8	205
Total		228	19	5	219	2,093	62	6	301	49	22	32	3,036
Europe:													
Belgium-Luxembourg	1	1	1	2,176		876	8	1	14	101	3	9	3,191
Denmark		(2)		359		206	(2)	8	15	(2)	(2)	3	591
France		10	(2)	637	359	113	4	50	54	368	4	2	1,601
Germany, West		98	17	692	583	474	2	34	135	708	9	4	2,756
Greece		181				116	(2)	(2)	1		(2)	3	301
Italy	(2)	474	1		499	802	4	10	61	1,111	5	8	2,975
Netherlands		107	6	1,316	438	408	3	5	69	2,129	3	8	4,492
Norway		(2)				48	(2)	(2)	4	681	1	3	737
Sweden		1	(2)	1,276		466	2	(2)	14	49	1	12	1,821
United Kingdom	424	102	221	386	1,302	1,253	1	4	79	78	16	1	3,867
Other		10	3	(2)		656	9	1	62	585	8	9	1,343
Total	425	984	249	6,842	3,181	5,418	33	113	508	5,810	50	62	23,675

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Asia:													
India	-------	17	(2)	11	1	1,829	5	(2)	3	60	12	8	1,946
Indonesia	-------	17	(2)	22	-------	133	1	-------	5	-------	20	1	199
Japan-Nansei and Nanpo Islands	1,266	212	6	8,688	5,914	1,935	13	4	33	3,263	27	22	21,383
Malaya, Federation of, and Singapore	-------	39	-------	-------	-------	179	(2)	-------	1	-------	3	4	226
Philippines	-------	17	1	-------	-------	367	16	1	16	-------	13	22	453
Turkey	-------	114	2	-------	-------	492	(2)	-------	1	-------	(2)	27	636
Other	1	79	1	(2)	(2)	1,288	50	1	68	46	14	49	1,597
Total	1,267	495	10	8,721	5,915	6,223	85	6	127	3,369	89	133	26,440
Africa:													
Congo, Republic of the, and Ruanda-Urundi	-------	480	95	182	-------	240	13	-------	1	-------	2	40	1,053
South Africa, Republic of	-------	18	2	-------	88	367	206	1	46	(2)	17	16	761
United Arab Republic (Egypt)	-------	9	4	-------	-------	318	(2)	-------	(2)	-------	1	10	342
Western Africa, n.e.c	-------	2	-------	-------	526	19	2	-------	-------	-------	(2)	2	551
Other	-------	8	6	(2)	-------	291	14	1	13	-------	8	18	359
Total	-------	517	107	182	614	1,235	235	2	60	(2)	28	86	3,066
Oceania:													
Australia	-------	120	15	4	385	885	7	2	34	174	7	5	1,638
French Pacific Islands	-------	67	22	177	26	4	2	10	(2)	-------	-------	(2)	308
New Zealand	-------	93	4	-------	-------	87	(2)	3	11	-------	3	28	229
Other	-------	57	1	1	1	1	1	2	-------	-------	-------	(2)	64
Total	-------	337	42	182	412	977	10	17	45	174	10	33	2,239
Grand total	1,697	6,418	513	16,808	15,281	17,822	656	4,597	1,455	10,763	240	566	76,816
Shipments from the United States to territories and possessions:													
Puerto Rico	-------	6	145	-------	(4)	116	38	(4)	(4)	(4)	(4)	6	311
Virgin Islands	-------	63	9	60	(4)	7	2	(4)	(4)	(4)	(4)	(2)	141
Wake	-------	449	-------	44	(4)	(2)	3	(4)	(4)	(4)	(4)	(2)	496
Other	-------	57	5	180	(4)	7	5	(4)	(4)	(4)	(4)	(2)	254
Total	-------	575	159	284	(4)	130	48	(4)	(4)	(4)	(4)	6	1,202
Exports from territories to foreign countries: Puerto Rico	-------	1	-------	2,077	(2)	(2)	(2)	4	-------	-------	-------	-------	2,082
Total net shipments from the United States	1,697	6,992	672	15,015	15,281	17,952	704	4,593	1,455	10,763	240	572	75,936

[1] Includes naphtha but excludes benzol: 1962, 982,361 barrels; 1963, 1,541,316 barrels.
[2] Less than 1,000 barrels.
[3] Revised figure.
[4] Not separately classified.

Source: Bureau of the Census.

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TABLE 88.—World production of crude petroleum by countries [1]

(Thousand barrels) [2]

Country	1959	1960	1961	1962	1963 [3]
North America:					
Canada	184,778	189,534	220,848	244,136	258,435
Cuba [4]	192	[5] 108	[5] 80	[5] 90	[5] 72
Mexico	96,393	99,049	106,784	111,830	114,867
Trinidad	40,919	42,357	45,768	48,876	48,678
United States	2,574,590	2,574,933	2,621,758	2,676,189	2,752,723
Total	2,896,872	2,905,981	2,995,238	3,081,121	3,174,775
South America:					
Argentina	44,613	64,132	84,418	98,154	97,221
Bolivia	3,170	3,574	2,989	2,911	3,285
Brazil	23,590	29,613	34,807	33,401	35,710
Chile	6,428	7,231	9,263	11,689	13,206
Colombia	53,574	55,770	53,247	51,918	60,343
Ecuador	2,759	2,730	2,926	2,573	2,465
Peru	17,733	19,255	19,371	21,134	21,468
Venezuela	1,011,419	1,041,675	1,065,757	1,167,916	1,185,511
Total	1,163,286	1,223,980	1,272,778	1,389,696	1,419,209
Europe:					
Albania	3,195	4,854	5,144	5,238	5,339
Austria	16,946	16,874	16,237	16,694	18,271
Bulgaria	1,402	1,460	1,510	1,453	1,266
Czechoslovakia	834	929	1,045	1,200	1,220
France	11,594	14,233	15,578	17,071	18,161
Germany, West	36,981	40,076	44,968	48,943	53,325
Hungary	7,904	9,283	11,117	12,521	13,398
Italy	11,551	13,613	13,432	12,303	12,155
Netherlands	12,367	13,378	14,271	14,974	15,377
Poland	1,277	1,442	1,503	1,502	1,577
Rumania	83,496	85,712	86,321	88,420	91,171
U.S.S.R. [6]	945,766	1,079,371	1,212,300	1,359,600	1,503,800
United Kingdom	612	649	784	820	895
Yugoslavia	4,188	6,671	9,479	11,299	11,930
Total [6]	1,138,113	1,288,545	1,433,689	1,592,038	1,747,885
Asia:					
Bahrain	16,473	16,500	16,444	16,446	16,503
Burma	3,967	4,078	4,194	4,366	4,761
China [5]	27,010	40,150	45,260	49,640	54,750
India	3,377	3,370	3,356	8,016	12,266
Indonesia	139,038	152,988	155,369	167,771	165,002
Iran	344,800	385,748	431,653	481,939	538,107
Iraq	311,193	353,833	365,594	366,832	422,581
Israel	925	932	1,133	1,126	1,091
Japan	2,838	3,678	4,590	5,316	5,485
Kuwait	504,855	594,278	600,226	669,284	705,471
Kuwait—Neutral Zone	42,438	49,829	65,153	89,224	114,535
Mongolia [5]	220	290	360	360	360
Pakistan	2,333	2,636	2,829	3,338	3,514
Qatar	61,431	63,088	64,386	67,911	70,129
Sarawak and Brunei	40,072	34,005	30,551	28,286	29,639
Saudi Arabia	399,821	456,453	508,269	555,056	594,592
Taiwan (Formosa)	13	14	17	14	19
Trucial States				5,976	17,571
Turkey	2,700	2,624	3,075	4,157	5,084
Total [6]	1,903,504	2,164,494	2,302,459	2,525,058	2,761,460
Africa:					
Algeria [7]	9,686	67,613	121,494	158,094	182,806
Angola	361	477	757	3,404	5,776
Congo, Republic of (formerly French)		365	724	926	820
Gabon, Republic of	5,295	5,626	5,446	5,992	6,446
Libya			6,642	67,052	167,786
Morocco	712	695	603	968	1,140
Nigeria	4,067	6,552	16,802	24,624	27,644
Senegal		12	16	3	
United Arab Republic (Egypt)	21,303	23,968	26,129	32,321	38,759
Total	41,424	105,308	178,613	293,384	431,177

See footnotes at end of table.

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TABLE 88.—World production of crude petroleum by countries[1]—Continued

(Thousand barrels)[2]

Country	1959	1960	1961	1962	1963[3]
Oceania:					
Netherlands New Guinea	1,656	1,538	1,082	917	924
New Zealand	5	5	4	4	4
Total	1,661	1,543	1,086	921	928
World total	7,144,860	7,689,851	8,183,863	8,882,218	9,535,434

[1] This table incorporates some revisions.
[2] 42 gallon barrels.
[3] Preliminary figures.
[4] Natural naphtha and gas oil.
[5] Estimate.
[6] U.S.S.R. in Asia (including Sakhalin) included with U.S.S.R. in Europe.
[7] Including Sahara.

NATIVE ASPHALT

Bituminous Limestone and Sandstone.—The production of bituminous limestone in 1963 was 1,218 thousand short tons, a gain of 2 percent for the year. The average value per short ton was $2.46 compared with $2.44 in 1962. Sandstone production for the year was down to 1,779 short tons, but the average value per short ton was $8.43 (52 cents more than in 1962).

Gilsonite.—The production of gilsonite cannot be revealed by the Bureau of Mines because of the limited number of producers. All gilsonite production is in the State of Utah. It is transported by pipeline to a refinery in southern Colorado for processing.

TABLE 89.—Production and value of bituminous limestone and bituminous sandstone in the United States, 1953–63

Year	Bituminous limestone		Bituminous sandstone	
	Production (short tons)	Value (thousand)	Production (short tons)	Value (thousand)
1953	1,327,224	$3,408	113,320	$942
1954	1,191,793	2,782	146,029	905
1955	1,330,311	3,274	96,896	837
1956	1,358,669	3,223	99,864	891
1957	1,134,781	2,996	33,726	225
1958	1,305,555	3,218	20,938	125
1959	1,509,277	3,810	9,488	58
1960	1,235,658	3,009	7,216	61
1961	1,134,340	2,884	2,158	18
1962	1,192,545	2,914	2,783	22
1963	1,217,837	2,999	1,779	15

WATER USAGE IN THE PETROLEUM AND NATURAL GAS INDUSTRIES

The data covering water usage by the petroleum and natural gas industries in the United States for the year 1962 are based on a survey conducted by the Bureau of Mines. A canvass was conducted for the three principal users of water in these industries. These were the well-drilling contractors, who are responsible for about 95 percent of the total wells and footage drilled; companies conducting secondary

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recovery operations; and natural-gas processing plants. Water usage by the petroleum refining industry was excluded from this survey since it is considered a manufacturing industry. Data on water input by the petroleum refining industry has been covered in other surveys conducted by the Bureau of the Census, the Geological Survey, and the American Petroleum Institute.

According to the survey, the total water usage by these industries in 1962 was 7 billion barrels, with secondary recovery operations accounting for 61.0 percent; natural gas processing, 34.5 percent; and well drilling, 4.5 percent. The volume of water input in the various States is related to the petroleum and natural gas activities within the State.

TABLE 90.—Water input in well drilling, secondary recovery operations, and natural gas processing plants in the United States,[1] 1962, by State

(Thousand barrels)

	Well drilling	Secondary recovery operations	Natural gas processing	Total
Alabama	261			261
Alaska	1,243			1,243
Arizona	115			115
Arkansas	3,373	34,369	7,427	45,169
California	13,624	474,983	54,192	542,799
Colorado	4,003	88,844	6,691	99,538
Illinois	2,992	419,693	[2]	422,685
Indiana	678	24,425		25,103
Kansas	13,389	324,971	15,901	354,261
Kentucky	1,434	59,204	[3] 17,564	78,202
Louisiana	73,109	59,415	1,297,600	1,430,124
Michigan	1,150	5,666	[2]	6,816
Mississippi	8,870	10,271	4,788	23,929
Montana	3,499	11,061	[3] 6,624	21,184
Nebraska	3,397	47,032	2,885	53,314
New Mexico	11,442	53,729	73,242	138,413
New York	177	34,636		34,813
North Dakota	1,597	27,026	1,853	30,476
Ohio	693	9,118		9,811
Oklahoma	47,486	1,083,499	80,060	1,211,045
Pennsylvania	737	164,500	6,192	171,429
Tennessee	49	1,123		1,172
Texas	116,510	1,192,173	682,018	1,990,701
Utah	3,603	10,870	[3]	14,473
West Virginia	1,354	1,750	162,902	166,006
Wyoming	6,199	198,043	17,198	221,440
Other	[4] 313			313
Total	321,297	4,336,401	2,437,137	7,094,835
Percent of total	4.5	61.0	34.5	100

[1] Bureau of Mines data supplemented by data from the Oil and Gas Journal and State agencies.
[2] Illinois and Michigan included in Kentucky.
[3] Utah included in Montana.
[4] Includes Florida 49, Georgia 3, Maryland 20, Missouri 30, Nevada 24, Oregon 57, South Dakota 32, Virginia 21, and Washington 77.

Water input in connection with secondary recovery operations, which includes waterflooding and pressure maintenance, totaled 4.3 million barrels in 1962. Texas and Oklahoma accounted for over half of this total. Other States reporting large volumes were California, Illinois, and Kansas.

Louisiana accounted for 1.3 billion barrels of the total 2.4 billion barrels of water input at natural-gas-processing plants in the United States in 1962.

The amount of water required in well-drilling operations during 1962 was 321 million gallons.

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Helium

By Harold W. Lipper[1]

HELIUM shipments in 1963 exceeded the volume shipped during the previous year for the 14th successive time. Shipments from Bureau of Mines plants were 627.3 million cubic feet, an increase of 5 percent over the volume shipped in 1962. Production from Bureau of Mines plants totaled 774.2 million cubic feet. The Bureau purchased 1,420 million cubic feet of helium in the helium conservation program and stored it underground for future use. Each of the five plants, financed and built by private industry for helium conservation, made deliveries during the year.

Helium continued to play a key role in space, atomic energy, defense, and other research programs. Additional capacity for liquefying helium became available, and the first civilian helium-cooled nuclear-powered reactor in the United States began pre-operation testing.

PRODUCTION

Helium having a purity of 99.995 percent by volume and designated grade A is produced at each of five Bureau of Mines plants and at one privately owned plant. Additional helium, designated crude helium because it is a 50–50 mixture of helium and nitrogen, is produced at five privately owned plants and is purchased by the Bureau under the helium conservation program. Bureau of Mines plants produced 774.2 million cubic feet of grade A helium from helium-bearing natural gas during 1963, an increase of 7 percent over the record set in 1961. About thirty-five million cubic feet of helium was produced by the Kerr-McGee Oil Industries, Inc., plant. This plant extracts helium from resources the company owns or controls in the Pinta Dome field, Apache County, Ariz. The company markets its helium to non-Federal customers, principally on the west coast.

Helium extracted from natural gas en route to fuel markets by the five privately owned conservation helium plants was purchased by the Bureau and amounted to 1,420 million cubic feet, bringing the total volume of helium extracted from natural gas in the Government's helium program to 2,194 million cubic feet.

Bureau of Mines helium extraction plants are located at Amarillo and Exell, Tex.; Keyes, Okla.; Otis, Kans.; and Shiprock (Navajo) N. Mex. Each of the plants operated at nearly maximum rates. Seasonal production rates exceeded helium demand, and no helium was withdrawn from the conservation supply. A total of 165 million

[1] Technical assistant, Office of Assistant Director, Helium.

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cubic feet of helium produced in Bureau plants was stored underground.

TABLE 1.—Helium production in the United States, 1921–63

(Million cubic feet)

Year	Production	Year	Production
1921–28	[1] 5.8	1961	727.1
1929–42	[1] 11.8	1962	683.1
1943–49	[1] 83.5	1963	2,194.0
1950–54	[1] 138.0		
1955–59	[1] 313.4	Total 1921–63	[2] 7,299.3
1960	642.0		

[1] Annual average.
[2] Does not include helium produced at the privately owned Kerr-McGee plant but includes helium purchased for conservation.

SHIPMENTS

Helium shipments from Bureau of Mines plants totaled 627.3 million cubic feet. Federal agencies received 473.7 million cubic feet, and 153.6 million cubic feet was sold to non-Federal (commercial) customers. In delivering helium to customers, Bureau plants filled and shipped 1,820 tank cars, 1,212 trailers, and 262,088 standard gas cylinders.

The Bureau fleet of 240 tank cars was reduced to 236 cars by the transfer of 4 older, low-capacity cars to the National Aeronautics and Space Administration (NASA) for use as storage containers for helium.

Helium from all Bureau plants is shipped in tank cars except for the helium from the Amarillo, Tex., plant which is specially equipped for handling small cylinders. All shipments in Interstate Commerce Commission (ICC) 3A and 3AA cylinders by the Bureau are from the Amarillo plant. Each of the Bureau plants can fill automotive semitrailers, and with the exception of the Otis plant, each plant can accommodate container filling pressures up to 4,000 pounds per square inch, gage.

CONSUMPTION AND USES

Sale of helium from Bureau plants in 1963 increased 5 percent over the record of 599.5 million cubic feet set in 1962. Shipments by the Bureau of Mines are shown in table 2.

About 35 million cubic feet of privately produced helium was consumed in addition to that supplied by the Bureau of Mines. Consequently, the total volume of helium delivered to consumers and presumably used in 1963 was about 662 million cubic feet.

Results of a survey of helium utilization conducted by the Bureau for the calendar year 1962 were released in November 1963. The survey provides information on helium use that has not been previously available. This information is summarized in table 3. A similar survey conducted by the Bureau in 1955 covered only the helium delivered to its non-Federal customers. At that time, there

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TABLE 2.—Shipments of helium from Bureau of Mines helium plants in 1963

	Million cubic feet	Percent
Federal agencies:		
Department of Defense	337.3	53.8
Atomic Energy Commission (AEC)	75.5	12.0
National Aeronautics and Space Administration (NASA)	52.6	8.4
Weather Bureau	7.8	1.2
Other	0.5	0.1
Total	473.7	75.5
Non-Federal consumers	153.6	24.5
Total shipments	[1] 627.3	100.0

[1] Actual use by the Federal agencies is not reflected by the deliveries shown above. The Weather Bureau obtains about as much helium from the Navy as it receives from the Bureau of Mines. The Navy also furnishes helium to the National Aeronautics and Space Administration and Air Force installations.

was no other source of large quantities of helium in the United States. Although the recent survey of helium utilization covered helium used in 1962, the same general pattern is believed to be representative of uses during 1963.

TABLE 3.—Utilization of helium in 1962

(Volume percent)

Use	(1) Overall use	(2) Federal agency use	(3) Private company use	(4) Private company use on Government contracts	(5) Federal agency use and use on Government contracts	(6) Non-Government use	(7) 1955 survey [1]
Pressurizing	45.0	60.5	0.5	1.0	52.5	----------	[2]
Welding	15.0	7.0	38.0	50.0	12.5	30.0	64.5
Controlled atmosphere	12.5	11.0	17.0	6.0	11.0	21.5	[3] 16.4
Research	11.0	8.0	19.5	25.0	10.5	14.0	5.1
Lifting gas	5.5	7.0	1.0	1.5	6.0	2.5	1.2
Purging	3.0	3.0	3.0	2.5	2.5	6.0	[2]
Leak detection	2.5	0.5	8.0	7.0	1.5	8.5	8.0
Cryogenics	1.5	1.5	1.5	3.0	1.5	1.5	[2]
Chromatography	1.5	----------	6.0	1.0	----------	10.0	[2]
Heat transfer	1.0	1.0	1.0	.5	1.0	----------	[2]
Other [4]	1.5	0.5	4.5	2.5	1.0	6.0	4.8
Percent of total volume	100	74	26	11	85	15	27
Volume (million cubic feet)	630	468	162	71	539	91	[5] 64

[1] Compare with column 3.
[2] No information obtained in 1955 survey.
[3] Includes percentages of use for titanium production and fabrication, transistors, and zirconium production from the 1955 survey.
[4] Includes uses for synthetic breathing mixture, medical, tracer, and miscellaneous purposes.
[5] Total helium use—1955—236 million cubic feet.

Pressurizing applications account for most of the helium that is used. In these applications, helium provides pressure to push fuel into pumps that supply the rocket engines on boosters, such as Atlas and Titan I. In the Atlas, helium serves an important secondary purpose by filling and pressurizing the thin-skinned fuel tanks as the fuel is consumed to provide the rigidity necessary to support the payload and to prevent collapse and failure of the tanks in flight. Helium is also used as a pressurizing medium for testing many of the delicate and intricate piping assemblies and components on which successful

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launches depend. Development of the large, Saturn-class, liquid-fueled rocket engines will likely require increasing volumes of helium for test and operational purposes.

Shielded-arc welding continues to require large volumes of helium and is the largest single industrial use. In addition to welding in constructing ships, aircraft, spacecraft, and rocket structures, helium is also used in the welding process for items such as food handling equipment, photographic developing equipment, diesel engine parts, nuclear reactor equipment, hardware, architectural shapes, electrical devices, and in the manufacture of many other products made from stainless steel, aluminum, copper, titanium, and zirconium. Much of the helium used for welding is a mixture of 75 percent helium-25 percent argon. Argon has replaced helium in some welding applications. However, helium has some technical advantages that make it preferable in many instances.

Helium serves a variety of purposes as a controlled atmosphere. It is used in the growth of germanium and silicon crystals for transistors, in the processing of fuels for nuclear energy purposes, and for cooling vacuum furnaces. In one small but interesting use, helium replaces the air in equipment used for X-ray fluorescence spectrometry analysis. By replacing the air in the apparatus with helium, it is possible to determine the elements having atomic numbers 16 to 25. These include sulfur, potassium, calcium, vanadium, chromium, and manganese. In addition to the foregoing uses, some hermetically sealed devices are filled with helium to provide a proper environment for the contained mechanisms.

In research, helium is used for all the purposes listed in table 3. Other uses include aerodynamic research using helium in wind tunnels and shock tubes, study of adsorption techniques, development of improved seals and valves for positive shutoff, pharmaceutical and biological research, particle physics investigations, development of improved light sources, radiation detection devices, plasma arc studies, mass transfer studies, tensile and impact tests of materials, solid state physics, and development of new techniques for X-ray analysis. Research involving the behavior of materials at temperatures near absolute zero and the development of superconducting magnets require the use of significant amounts of liquid helium.

Use is made of the ease and rapidity with which helium will pass through minute openings in detecting leaks or more often verifying the absence of leaks in a variety of operations and products. Sensitive helium detection devices are said to be capable of identifying helium leaks so small that 3,000 years would be required for a quart of helium to pass through the opening. The method is used to assure freedom from leaks in component parts and piping systems of nuclear reactors, metallic bellows assemblies, electron tubes, hermetically sealed electrical devices, and other items where safe operation or satisfactory service life are dependent on leakproof characteristics. The relatively large volume of helium used in leak detection exclusively for commercial purposes is primarily to assure the high quality and dependability of many items of consumer goods.

One of the newer uses for helium is as a carrier gas in chromatography. The principles of chemical analysis by chromatographic means have been known for some time, but requirements arising in

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recent years for higher purity products, more rapid analysis, and greater product yields have stimulated the use of chromatographic analysis in the refining, petrochemical, food processing, drug, chemical, and allied industries. A single chromatograph requires only a small volume of helium annually, but the cumulative effect of a large number of instruments is apparent in the more than 9 million cubic feet used annually for this purpose.

Another recent use of helium is for heat transfer purposes, primarily in gas-cooled nuclear reactors for electric power generation. Helium has good characteristics for removing heat from the nuclear fuel, is reported to permit better efficiencies by making it possible to operate a reactor at higher temperatures than would be possible with other coolants, and does not become radioactive.

Small but important volumes of helium are used for other purposes. These include mixtures of helium and oxygen in the treatment of asthma and other respiratory ailments, use of helium as a diluent for anesthetics, use of helium as a tracer, and use of helium for miscellaneous minor purposes. Table 4 shows volumes of helium consumed annually since 1950.

TABLE 4.—Helium use in the United States

(Million cubic feet)

Year	Quantity	Year	Quantity
1950	81	1957	310
1951	109	1958	352
1952	145	1959	375
1953	158	1960	475
1954	190	1961	551
1955	236	1962	630
1956	267	1963	662

RESOURCES

There were no major additions to the known helium resources during 1963. In the continuing helium survey carried on by the Bureau of Mines, 394 samples were analyzed without discovering new deposits of helium-bearing natural gas comparable to the known major deposits.

The total helium resources of the United States in helium-bearing natural gas containing at least three-tenths (0.3) percent helium by volume are estimated to be 196 billion cubic feet as of January 1, 1961. Approximately 94 percent of these resources is contained in five helium-bearing gasfields: (1) The Hugoton field of Kansas, Oklahoma, and Texas; (2) the Panhandle field of Texas; (3) the Keyes field of Oklahoma; (4) the Greenwood field of Kansas and Colorado; and (5) the Cliffside field of Texas.

Helium-bearing natural gas resources available to the five Bureau of Mines helium plants represent about 10 percent of the known resources. Contracts to obtain helium for conservation are with companies that control about 60 percent of the total helium resources. The Bureau's two largest plants (Exell, Tex., and Keyes, Okla.) extract helium from gas produced within the area where the major

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helium resources are found. Plants at Shiprock, N. Mex., and Otis, Kans., extract helium from gas produced in small, isolated fields outside the area. The only developed source of helium-bearing natural gas owned by the Government is the Cliffside field in the Texas Panhandle not far from Amarillo, Tex. Helium from this source is extracted at the Bureau's Amarillo plant.

Some of the oil and gas fields discovered or developed in the past few years in eastern Utah and western Colorado contain helium. For the most part, however, the helium resources of these fields are limited. It is estimated that the combined helium resources of all presently known fields in this area constitute only about 3 percent of the total helium resources of the Nation. Natural gas production from these fields, likewise is limited, and the resulting wastage of helium constitutes only a small percentage of the total volume wasted annually.

Two minor helium-bearing natural gas deposits discovered on lands of the public domain were established as Helium Reserve No. 1, Woodside structure, Utah, and Helium Reserve No. 2, Harley Dome, Utah, in March 1924 and in June 1933, respectively. The two reserves are very small in relation to the present-day rate of helium use. Neither deposit has produced, and the helium-bearing gas they contain has no value as fuel.

A recently discovered deposit of helium-bearing natural gas in Canada has led to the construction of a plant near Swift Current in Saskatchewan Province. The plant is reported to have an annual helium production capacity of 12 million cubic feet. Reports indicate that the helium will be marketed principally in Canada and in Europe.

Helium-bearing natural gases offer the only presently known economical sources for producing helium. However, other sources are of interest; such as gases from mineral springs, fumaroles, and volcanoes; the air; rocks; minerals; certain sands; and meteorites. Helium can also be formed by nuclear bombardment and fusion.

CONSERVATION

National helium resources appear to be adequate to meet predicted demands only if the large volume now wasted in fuel gases is saved for future use. The resources are diminishing rapidly as helium-bearing natural gas is used for fuel. Unless the helium is recovered before the natural gas is consumed, the helium is lost without serving any useful purpose. The U.S. Department of the Interior launched a long-range helium conservation program in 1961 by entering into four contracts under which private industry financed, built, and operates five plants to recover helium from natural gas before the gas goes to market. Two of the plants began production in 1962. They were the Northern Helex Company plant at Bushton, Kans., and the Phillips Petroleum Company plant in Hansford County, Tex. During 1963, the remaining three plants began operations. These plants are Cities Service Helex, Inc. at Ulysses, Kans., Phillips Petroleum Company at Dumas, Tex., and National Helium Corporation near Liberal, Kans.

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Helium is purchased by the Bureau of Mines for conservation and ultimate sale under provisions of Public Law 86–777, which amended the Helium Act of 1925, as amended (43 Stat. 1110; 50 U.S.C. 161, 163–166) and which became effective March 1, 1961. Contracting authority for such purchases in an amount not to exceed $47.5 million a year became available in the act (Public Law 87–122) making appropriations for the U.S. Department of the Interior and related agencies for the fiscal year ending June 30, 1962. All the available contracting authority was used in contracts with the four companies. Each contract is for a period of 22 years. Helium purchased in the conservation program is an impure mixture of helium and nitrogen with small amounts of hydrocarbon gases. The mixture is known as crude helium and has a nominal composition of about 50 percent helium and 50 percent nitrogen. The plants deliver crude helium into a 425-mile pipeline system built by the Bureau to transport helium to the Government Cliffside gasfield near Amarillo, Tex. Helium acquired for conservation is stored underground in the gasfield for withdrawal and purification as needed in the future to augment the supply of helium from helium-bearing natural gas. Table 5 shows the volume of helium delivered during 1963 from each of the plants.

TABLE 5.—Conservation helium purchased by the Bureau of Mines in 1963

Plant:	*Helium delivered (million cubic feet)*
Northern Helex Company	208
Cities Service Helex, Inc.	75
National Helium Corporation	457
Phillips Petroleum Company, Dumas, Tex.	482
Phillips Petroleum Company, Hansford County, Tex.	198
Total	1,420

In previous years, the Bureau has stored small quantities of helium produced at its plants in excess of market requirements in the Cliffside field. Table 6 shows the amounts stored.

TABLE 6.—Helium in conservation storage

Year:	*Million cubic feet*
1960	273
1961	447
1962	524.6
1963	2,110

PRICES

The revised Helium Act (Public Law 86–777) directs agencies of the Federal Government to purchase all major helium requirements from the Secretary of the Interior and provides that helium shall be sold at prices adequate to cover all costs of carrying out provisions of the Act, including repayment to the Treasury of the United States, with interest, all funds that may be borrowed to sustain the program and the cost of all capital assets.

Until November 18, 1961, sales were at prices established in 1954 of $15.50 and $19 a thousand cubic feet (f.o.b. plant) for Federal and non-Federal purchasers, respectively. An increased price to cover all costs of carrying out the provisions of the Helium Act and to make

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the prescribed repayments was calculated to be $35 a thousand cubic feet. On November 18, 1961, the $35 price went into effect and is applicable to all users. Revised regulations, a schedule of charges, and other information on the sale of helium and rental of containers by the Bureau of Mines are included in the Code of Federal Regulations (30 CFR 1).

FOREIGN TRADE

Helium is exported under licenses issued by the Office of Munitions Control, U.S. Department of State. Volumes of helium exported as determined from the 1962 helium utilization survey are shown in table 7 and are believed to be representative of the export pattern in 1963.

TABLE 7.—U.S. exports of helium in 1962 [1]

Country	Thousand cubic feet	Country	Thousand cubic feet
Belgium	108.0	Jamaica	0.5
Canada	3,010.0	Japan	1,040.0
Denmark	4.0	Mexico	360.0
Finland	4.0	Netherlands	14.0
Formosa	12.0	Nicaragua	1.0
France	1,327.0	Norway	4.0
Germany, West	839.0	Portugal	0.5
Greece	1.0	Sweden	25.0
Guatemala	1.0	Switzerland	289.0
India	1.0	United Kingdom	1,868.0
Israel	77.0		
Italy	76.0	Total	9,062.0

[1] Includes helium exported by commercial distributors and civilian agencies of the Federal Government. Helium used abroad by the defense agencies is not included.

TECHNOLOGY

Addition of a second 125-liter-an-hour helium liquefier at the NASA Lewis Research Center, Cleveland, Ohio, increased its capability, advanced the technology for liquefying helium and made available a supply of liquid helium for precooling the second stage engines for the Centaur space booster. The liquefaction of helium at the Lewis Research Center was intended initially to supply the cooling needs in equipment for simulating the near absolute zero temperature and near perfect vacuum of outer space. Development of the need for liquid helium to test engines for Centaur was reported to require much of the capacity of the two 125-liter-an-hour units at Lewis as well as a significant part of the output of the 100 liters an hour liquefier owned and operated by Linde Division of Union Carbide at Amarillo, Tex. Prior to about 1962, the capacity of the average helium liquefier was 4 to 6 liters an hour. The Bureau of Mines continued consideration of the feasibility of producing liquid helium at its plants for the purpose of reducing costs of transporting helium to points of use.

The first civilian gas-cooled power reactor in the United States was built at Oak Ridge, Tenn. Helium is used to transfer heat from the reactor core to water to produce high pressure steam. The

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Atomic Energy Commission (AEC) announced that the experimental reactor will produce about 22,300 kilowatts of electricity which will be used in the AEC plants beginning in 1965.

A 40,000-kilowatt electrical capacity helium-cooled nuclear power reactor neared completion at Peach Bottom, Pa. This power reactor is being built by Philadelphia Electric Company and 52 other U.S. utility companies for the commercial production of electric power.

Work completed at the Bureau of Mines Helium Research Center and the Helium Operations Office at Amarillo, Tex., for which results were published included values for phase equilibria of helium gas mixtures;[2] information on the compressibility of gases;[3] methods and tables for computing the volume of helium in containers;[4] and additional information collected in the continuous survey of helium-bearing natural gases.[5]

Work at the Helium Research Center is aimed at learning more about the properties of helium for the purpose of increasing its utility. Thermodynamic and other data for helium are being reviewed systematically with an objective of identifying "best" values and closing gaps in data by experiments as warranted. Current projects include development of a method for measuring the heat capacity of helium and its mixtures; measurement of the absolute viscosity of helium; diffusion coefficients, the solubility of helium in liquefied gases, and investigation of metastable energy levels in liquid helium.

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Appendix

Table of Measurement

Volumetric measures

	U.S. gallons	Imperial gallons	Cubic feet	Barrels	Cubic centimeters	Liters	Cubic meter
1 U.S. gallon [1]	1.	0.83268	0.133681	0.0238095	3785.41	3.78533	0.0037854
1 imperial gallon [2]	1.20094	1	.160544	.028594	4546.04	4.54596	.004546
1 cubic foot	7.4805	6.2288	1	.17811	28317.01	28.316	.028317
1 barrel [3]	42	34.9726	5.6146	1	158987.55	158.984	.15899
1 cubic centimeter	.000026417	.00021996	.000035314	.0000062895	1	.00099997	.000001
1 liter	.264178	.219975	.035316	.00629	1000.027	1	.001000027
1 cubic meter	264.17	219.97	35.315	6.2898	1,000,000	999.973	1

[1] U.S. gallon = the volume occupied by 231 cubic inches.
[2] 1 imperial gallon = the volume occupied by 10 pounds of water at 62° F when weighed against brass in air at 30 inches of barometric pressure.
[3] 1 barrel = 42 U.S. gallons.

Weight measures

	Pounds	Kilograms	Short or net tons	Metric tons	Long ton
1 pound	1	0.453592	0.0005	0.00045359	0.00044643
1 short of net hundred weight	100.0	45.359	.05	.04536	.04464
1 gross or long hundred weight	112.0	50.802	.056	.05080	.05
1 kilogram	2.20462	1	.0011023	.001	.0009842
1 short or net ton	2,000.	907.185	1	.907185	.892857
1 metric ton	2,204.6	1,000.	1.10231	1	.98421
1 long ton	2,240	1,016.05	1.12	1.01605	1

NOTE: 1 English water ton = the volume occupied by 1 long ton of water at 60° F.

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